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The Ferranti Dynamo Machine.

In an interesting descriptive article of this machine our esteemed contemporary, *Engineering*, says that in view of the great extension of electric lighting which is anticipated upon the passing of the numerous provisional orders now before Parliament, and more particularly in readiness for the needs of their own district of Hampstead, Messrs. Ferranti, Thompson, and Ince have been making more powerful types of their machines, and at the same time have introduced many changes which have resulted partly from their extended experience, and partly from the altered conditions of large machines as compared with small ones.

The dynamo which we illustrate on this page is one of these, and is designed to supply 5,000 lamps, each requiring a current having an electro-motive force of 200 volts, and an intensity of .33 amperes. It comprises three principal parts, each of which is self-contained. These are the armature (Fig. 2) and the two sets of field magnets (Fig. 3). The former consists of two discs or bosses insulated from each other and from the shaft, and carrying between them an insulated brass ring. To the periphery of this ring there are fastened at equal intervals eight copper strips 1¼ in. wide and 1.75 mm. thick, and these strips are then bent into the undulating form shown in Fig. 2, each strip making the circuit of the sinuous periphery of the armature twice, and being secured at its outer end to a rivet in electrical contact with one of the discs. Thus, as the strips are divided from each other by insulating material, there are eight parallel circuits around the armature, each starting from the internal brass ring and ending, after two complete revolutions, at one of the bosses. At either side of the armature is a collector ring, one of them being joined by a heavy copper connection (Fig. 2) to the internal brass ring, and the other to the opposite disc, so that the two rings form the terminals of the armature circuit. The current is not taken off by brushes in the usual way, but by solid rubbing pieces (Fig. 3) which embrace both sides of the collector rings, and are held up to their places by springs. The current is led from these collectors down heavy copper bars enclosed in a casing on the outside of the framing (Fig. 1) to two terminal studs, by which it is transmitted to the main leads. The outside diameter of the armature is 36 in., and its speed rather less than 1,000 revolutions per minute, at which rate it will furnish about 2,000 amperes of current with an electro-motive force of 200 volts. As the machine is separately excited from an independent generator, and as its internal resistance is exceedingly small in comparison with that of the outside circuit, to which it will be applied, it follows that the difference of potential at the terminals will be sensibly constant for a given speed, whether there be few or many lamps in action, and that these will burn with the same brilliancy whether a part or the whole of them be lighted. Further as the amount of current in circulation varies exactly with the number of lamps in action, the power absorbed by the machine rises and falls with the amount of light produced, and there is no waste of fuel at the time when the demands for current are but slight.

Although the armature shows considerable improvement in detail from the form in which it originally appeared, yet it is in the field magnet that the most striking alterations are to be seen. There are thirty-two magnets on each side alternately north and south, each north pole being confronted by a south pole, and likewise having a south pole on either side of it. The cores of the magnets are cast with the framing, which, as shown in Fig. 3, is made in halves, and thus by the removal of six bolts the machine may be divided in the center, and the whole of the internal parts laid open for inspection, while at the same time there is no danger of accidents from parts jarring loose and getting into the path of the armature. The magnet cores are excited by a current circulating among them through a system of copper bars. These are of rectangular section ¾ in. by ⅞ in., and are bent in a special machine to a shape somewhat like that of the conductor in the armature. Supposing the cores to be numbered 1, 2, 3, &c., the first bar will pass over 1, under 2, over 3, under 4, and so on; the second bar will pass under 1, over 2, under 3, over 4, and so on for the whole 9 bars and 32 cores, and thus each core will be completely surrounded both at its sides and ends by copper conductors. The exciting current will flow in the front or outermost bar down between 1 and 2, up between 2 and 3, down between 3 and 4, and so on; in the next bar it will follow the same course, and so through the whole nine, the connections being made in such a way as to secure that the current in all the conductors between each pair of cores shall flow in the same direction. In each undulation of the bars there are four plugs of insulating material inserted, and these act as distance-pieces to keep the metal out of contact. Likewise a grove is cut along each corner of the cores, and a key of insulating material inserted into it to keep the copper and the iron apart. The current from the excitor enters at one end of the upper studs (Fig. 1), traverses one set of copper bars, is then conveyed to the other set by a connecting bar, omitted in the figure, and finally emerges at the second terminal. As the resistance of this circuit is exceedingly small, the Ferranti Company have had to construct a special exciting machine which we hope to illustrate shortly.

Fig. 1.

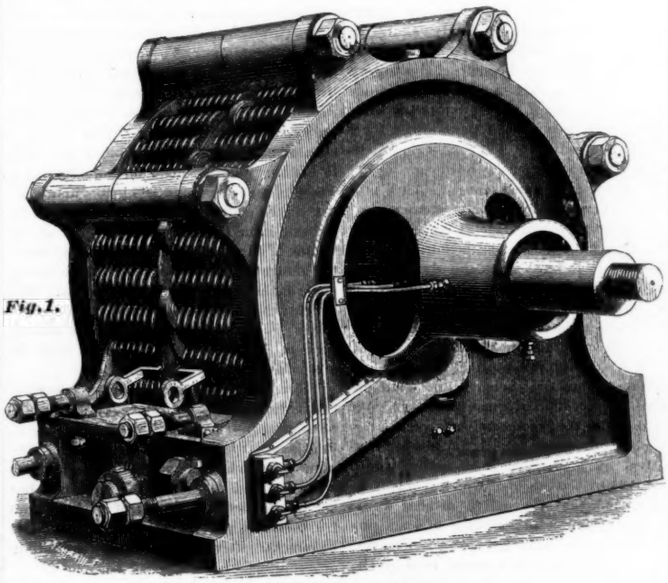
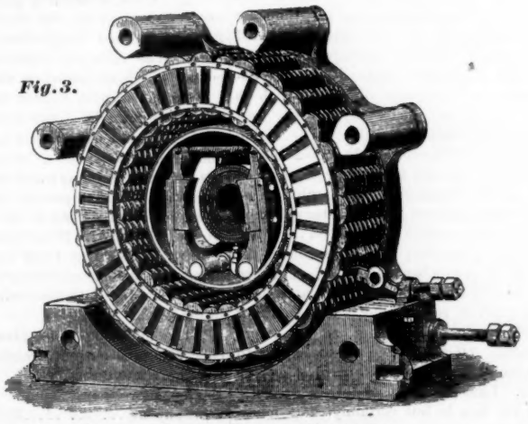


Fig. 3.



THE FERRANTI DYNAMO-ELECTRIC GENERATOR.

The mechanical details of the generator have been designed with great care. Each bearing has an oil cup of the usual form, and in addition to this three oil pipes in connection with a pump driven by the countershaft, and through these latter lubricants can be forced if the ordinary means fail to keep the bearings cool; all the parts are made interchangeable, and the whole machine can be entirely taken to pieces in a short time. At present we are not in a position to give any account of its performances, but as we believe that no other firm, except the Telegraph Construction Company, has as yet attempted the manufacture of a machine at all commensurate with the ambitious schemes of public lighting which have been put forth, we are sure that the public will await with interest to learn how much success has attended this attempt to provide apparatus for electric light undertakers suited to the responsibilities they have undertaken.

The Electrical Transmission and Storage of Power.

BY DR. C. WILLIAM SIEMENS, F. R. S., M. INST. C. E.

Amongst the numerous other applications of the electrical transmission of power, that to electrical railways, first exhibited by Dr. Werner Siemens at the Berlin Exhibition of 1879, has created more than ordinary public attention. In it the current produced by a dynamo machine, fixed at a convenient station and driven by a steam-engine or other motor, was conveyed to a dynamo placed upon the moving car, through a central rail supported upon insulating blocks of wood, the two working-rails serving to convey the return current. The line was 900 yards long, of 2-feet gauge, and the moving car served its purpose of carrying twenty visitors through the Exhibition each trip. The success of this experiment soon led to the laying of the Lichterfelde line, in which both rails were placed upon insulating sleepers, so that the one served for the conveyance of the current from the power station to the moving car, and the other for completing the return circuit. This line has a gauge of 3 feet 3 inches, is 2,500 yards in length, and is worked by two dynamo machines, developing an aggregate current of 9,000 Watts, equal to 12-H. P. It has now been in constant operation since the 16th of May, 1881, and has never failed in accomplishing its daily traffic. A line ½ a kilometer in length, but of 4 feet 8½ inches gauge, was established at Paris in connection with the Electric Exhibition of 1881. In this case, two suspended conductors in the

Fig. 3.

form of hollow tubes with a longitudinal slit were adopted, the contact being made by metallic bolts drawn through these slit tubes, and connected with the dynamo machine on the moving car by copper ropes passing through the roof. On this line 95,000 passengers were conveyed within the short period of seven weeks. The administration charged 25 centimes (2½d.), for the conveyance from end to end of the railway, and the amount was sufficient to pay all expenses. That, therefore, was a case of an electric railway that did pay.

An electric tramway, six miles in length, is nearly completed, connecting Portrush with Bush Mills, in the north of Ireland, in the installation of which I have been aided by Mr. Traill, as engineer of the company, and by Mr. Alexander Siemens, and Dr. E. Hopkinson, representing my firm. In this instance the two rails, 3 feet apart, are not insulated from the ground, but being joined electrically by means of copper staples, they form the return circuit, the current being conveyed to the car through a T-iron placed upon short standards, and insulated by means of insulite caps. Where a gap necessarily occurs, such as at a cross road, we simply stop the T-iron and commence it again at the other side of the gap, connecting the two ends by means of an insulated conductor below ground. In order to span this gap we have two brushes attached to the car, one in front and the other towards the back of the car, and the gap being a little less than the distance between the two brushes, the one brush catches the opposite side before the other one leaves. Thus by a simple arrangement we get over the difficulty of crossing by-roads. For the present the power is produced by a steam-engine at Portrush, giving motion to a shunt-wound dynamo of 15,000 Watts = 20 H. P., but arrangements are in progress to utilize a waterfall of ample power near Bush Mills, by means of three turbines of 40 H. P. each, now in course of erection. The working speed of this line is restricted by the Board of Trade to 10 miles an hour, which is readily obtained. With regard to this line, Dr. Edward Hopkinson, who is there, superintending the electrical arrangements, writes, "There is now no difficulty in starting the loaded car on the worst part of the hill, which a steam engine frequently fails to do." On this road there is a long, steep incline—1 in. 38—two miles in length. There was some doubt in my mind whether, with the arrangements adopted, this incline could be worked satisfactorily; it now appears it has been, and that the car is drawn up the incline without difficulty when fully loaded. I may, therefore, say that transmission or propulsion by electricity, even under adverse circumstances, is an accomplished fact. A further six miles of extension to Dervock will connect this railway with the railway system of the north of Ireland; we shall then have a length of twelve miles of line of the same gauge, and using the same carriages as those generally used there. Under these circumstances, it seems to me almost a pity that on the Embankment there should be made that series of unsightly and noisome ventilators to disembarrass the underground railway of steam and products of combustion, when it can be clearly demonstrated that electric propulsion would, for the underground railway, not only be the most agreeable, but also the cheapest mode of traction. I shall, at any rate, be most happy to afford to engineers every opportunity of studying this question.

The advantages of electrical propulsion are that the weight of the engine, so destructive of power and of the plant itself in starting and stopping, will be saved, and that perfect immunity from products of combustion will be ensured. The limited experience at Lichterfelde, at Paris, and with another electric line of 765 yards in length, and two feet two inches gauge, worked in connection with the Zaukerode Colliery since October, 1882, are extremely favorable to this mode of propulsion. I, however, do not advocate its prospective application in competition with the locomotive engine for main lines of railway.

For tramways within populous districts the insulated conductor involves a serious difficulty. It will be more advantageous under these circumstances to resort to secondary batteries, forming a store of electrical energy carried under the seats of the car itself, and working a dynamo machine connected with the moving wheels.

The secondary battery, to which I have already alluded in this lecture, is not an entirely new conception. The hydrogen gas battery suggested by Sir Walter Grove in 1841, realized in the most perfect manner the conception of storage, only that the power obtained from it was exceedingly slight. In working upon Sir William Grove's idea, twenty-five years ago, I constructed a battery of considerable power in substituting porous carbon for platinum, impregnating the same with a precipitate of lead peroxidized by a charging current. At that time little practical importance attached, however, to the subject, and even when Planté, in 1860, produced his secondary battery, composed of lead plates peroxidized by a charging current, little more than scientific curiosity was excited. It is only since the dynamo machine has become an accomplished fact, that the importance of this mode of storing energy has become of practical importance, and great credit is due to Faure, to Sellon, and to Volckmar, for putting this valuable addition to practical science into available forms. A question of great interest in connection with the secondary battery has reference to its permanence. A fear has been expressed by many that local action would soon destroy the fabric of which it was composed, and that the active surfaces would become coated with sulphate of lead, preventing further action. It has, however, lately been proved in a papar read by Dr. Frankland before the Royal Society, corroborated by simultaneous investigations by Dr. Gladstone and Mr. Tribe, that the action of the secondary battery depends essentially upon the alternative composition and decomposition of sulphate of lead, which is therefore not an enemy of, but the best friend to, its continued action. The action of the battery depends simply upon the decomposition of the coating of sulphate of lead, so that, commencing with sulphate of lead on both surfaces, this is on the one hand changed into metallic lead, and on the other hand into peroxide; by the action of the battery in producing power it is changed back into its original condition; and there is no *a priori* reason why such a battery should not be available for use for a very long time. Of course you cannot expect to get quite as much of effect out of it as you put in. I am not prepared to say precisely what the loss is, but certainly it is not of such serious import as to prevent the practical use of these secondary batteries. As regards their application to tramways, their usefulness will extend to lines in the interior of towns, and to crossing parts of towns where it would be difficult to establish separate insulated conductors; in such applications the batteries may be charged occasionally by the dynamo on the car in running down hill, or they may be charged in running upon level ground from the dynamo at the power station. In like manner for boat propulsion, the secondary battery is the only available means; because we could never hope to attach a vessel permanently to a rope connected with the shore. The batteries, although heavy, may be made part of the keel-weight; and although neither with the railway nor with the boat should I expect long distances to be traversed with electricity as a motive power, for short distances, and under conditions where steam power is for various reasons not applicable, I believe we have in electric energy an efficient and practicable means of propulsion.—*London Electrical Review.*

The Electric Railway at Brighton.

The London *Electrician* gives the following account of a new electric railway in England:

"We mentioned the fact that an electric railway had been constructed at Brighton by Mr. Magnus Volk, electrical engineer to the corporation of that town, in a recent note. The following additional particulars will, no doubt, prove interesting to our readers:

"The line was constructed very hurriedly; how hurriedly may be judged from the fact that the line was laid, the car, dynamo and motor built, and the engine and dynamo fixed in their places in about eighteen days. The generator is a Siemens D^8 machine, having an E.M.F. of 55 volts, and giving a current of 18 amperes at 1,700 revolutions per minute. One of Crossley's gas engines of two horse-power is used to drive the dynamo. It has two fly-wheels, and runs at 160 revolutions der minute. The dynamo, which is used on the car as a motor, was constructed by Mr. Volk; it weighs about 2¾ cwt., and runs at 700 revolutions per minute. The pulley is connected by means of a belt to a countershaft, from which another belt runs to another pulley fixed in one of the axles. The pulley of the motor is 5 in. in diameter, that on the countershaft 10 in., and that on the axle 12 in. The speed of the car up an incline of 1 in 100 is about five miles an hour; the return journey down the incline being made at the rate of ten miles an hour. The car carries twelve passengers, exclusive of the driver; it has carried as many as sixteen persons, however. It is lighted at night by a 20 candle-power Swan lamp.

"Reversal is effected by means of a commutator switch, which introduces a number of resistances into the circuit before breaking it, thus greatly diminishing the sparking. The same lever which actuates this switch also alters the lead of the brushes, of which but one pair is used. The wear of these brushes has been so slight that they only required to be removed after three weeks nearly continuous running.

"The track is about a quarter of a mile long, and rests on the shingle; ordinary flange rails and longitudinal sleepers are used. The rails are connected by No. 8 copper wire loops bolted on with ⅜ in. bolts.

"On the last bank holiday, 6th August, the car ran for eleven hours without a break. During this time it conveyed 1,200 passengers, and covered fifty miles. Since that date it has continued running every day without interruption up to the present time. The loss of current even during a wet day does not, we are told, exceed 10 per cent., and in dry weather is less than 5 per cent. The rails alone are used as conductors, and the wet weather has not interfered with the working in the least.

"The following tables give some details concerning the current, weight of car, etc. which are interesting:

Engine, 2 horse-power, nominal, about	3½ indicated.
Current	18 amperes.
E.M.F.	55 volts.
Weight motor	2¾ cwt.
" car	7 "
Load 12 persons	1 ton.
Gradient	1 in 100.
Speed mean	7 miles per hour.
Daily journey	25 to 30 miles.
Daily average number of passengers	350.

"Application is now being made to extend the system the whole front of Brighton under the Esplanade wall—a distance of two miles, and to run cars in both directions every ten minutes; and also to have an electric hoist to convey passengers up the face of the eastern wall, a height of 62 feet.

"The cost of carrying twelve passengers sixty journeys of half-mile each—*i. e.*, twelve passengers thirty miles, or one passenger 360 miles—is stated to be as follows:

Gas, 10 hours at 3d	2s. 6d.
Oil and waste, total	0s. 8d.
Conductor	3s. 4d.
Laborer to clean and attend to engine, repair shingle track, etc.	4s 2d.
Depreciation, 15 per cent. on £500, say	5s. 0d.
	15s. 8d.

or a trifle over ½d. per mile. As the car at present runs for five minutes only and then stands five minutes, its carrying capacity can be multiplied by two, in which case the only increased expense would be the cost of 50 per cent. more gas, the cost in wages remaining the same, so that the cost is only a trifle over ¼d. per mile per passenger, supposing it runs full every journey.

"For the particulars given above we are indebted to the kindness of Mr. Volk, who, we think, is to be congratulated upon the success that has attended the first electric railway at Brighton. We hope that its proposed extension will be carried out at no distant date, and that its working will continue to be successful."

New Electro-Dynamometer for Alternating Currents.

In *Wiedemann's Beiblätter*, M. Belatti describes a new and simple electro-dynamometer for very weak alternating currents. The needle of a galvanometer is replaced by a piece of soft iron wire, which tends to take up a position perpendicular to the plane of the magnetic meridian. If now the coils of the multiplier are set at an angle of 45 deg. with the same plane, the iron wire will be temporarily magnetized by the circulating current, and will tend to take up a position at right angles to the plane of the winding in whichever direction the current flows. With an instrument in which the iron wire was replaced by a bundle of wires .15 mm. thick and 17 mm. long, thoroughly annealed, and furnished with a mirror, with bifilar suspension 10 cm. long, and hung in a coil 35 mm. wide and 8 mm. thick, of .2 mm. copper wire, good results were obtained. On generating a telephone current by means of a Siemens trumpet, the deflection was too great to be measured, the index going beyond the scale. With ordinary intonation at 50 cm. from the telephone, the deflection was apparent.

Electric Street Cars in Paris.

A trial trip was successfully accomplished Sept. 6th in Paris by the French Electrical Power Company. At 3 o'clock, the vehicle, an ordinary three-horse tram-car, left the Place de la Nation, and after traversing the important thoroughfares, reached the starting point soon after 6 o'clock, the distance—30 miles—thus being made in three hours, and without the slightest accident, or frightening of horses on the route. When meeting any impediment the driver had no difficulty in bringing the car to a stand-still in a second. The ease with which the car was turned off one set of lines to another, across several yards of unmetalled ground, was likewise admirable. The locomotion is effected by Faure Sellon-Volckmar accumulators. The speed was nine and one-third miles an hour on level ground, and five and one half miles on an ascent. Yesterday's experiment, the first ever made over a long distance, proves the practicability of electric tram-cars, and it may safely be predicted that before long they will take possession of the tram routes of Paris. The estimated cost is one-half that of horse trams. Among those present at the trial were engineers and journalists. M. Ferdinand de Lesseps was also present. Next Sunday the trip will be from Vincennes to Versailles.

Electric Lighting at Pittsburgh, Pa.

The members of the Committee of Allegheny Councils on Gas indulged in a hot dispute a few days since when the bids for furnishing the department with an electric generator were opened. The Thomson-Houston Electric Light Company, whose bid was $4,500, and the Cutter Electric Light Company, whose bid with one kind of engine was $5,300, and another $5,000, being unaccompanied by bonds, caused the discussion but were finally excluded, and the bid of the Brush Electric Light Company for $4,950 was recommended to Councils. Besides this, bills to the amount of $1,350.43 were approved and two new gas lamps ordered.

Trouve's Rheostat.

A very useful rheostat has been devised by M. Trouvé, the well-known Parisian inventor. It consists of a German-silver spring enclosed in a nickel-plated tube, the spirals not being allowed to touch each other, and insulated from the tube by a pasteboard sheathing. Inside the spring is a rubbing contact formed of a metal rod split into four parts, like the split plugs of a resistance box. This rod is graduated into divisions. The current enters at one end of the spring, traverses it, the rubbing contact, and the graduated rod. When the rod is deeply inserted into the spiral coil, the current only traverses a few turns, and the resistance in the circuit is very small; but when the rod is pulled out the number of turns inserted is considerable. The divisions on the scale tell the number of turns in circuit. The device is employed by M. Trouvé in connection with his polyscopes to regulate the strength of current supplied by a small Planté accumulator. The plan of splitting the rubbing contact is worthy of attention by electricians.

Critical Points in Magnetism.

During the last meeting of the Physical Society in London, Prof. Hughes brought forward his magnetic experiments, and one of the speakers remarked that soft iron brought to a red-hot state loses its property of being attracted by a magnet. As a matter of fact, Prof. Hughes finds that this critical state is reached when iron is heated to a yellow-white or just below white and red heat. Steel also loses its power of being magnetized when heated, and on being cooled to 100° below zero it again loses it. Nickel, again, loses its magnetic property at a comparatively low temperature, namely, that of boiling water, and Dr. Crookes has devised a nickel cut-out for electric lighting based on this curious fact.

New Signals and Switches.

Last week the entire system of signals and switches used in the yard in the rear of the Grand Central station in New York and along the line of tracks through the Vanderbilt tunnel was changed. Up to that time the switches and signals had been set and changed by hand, about forty men being employed at that work in the yard between Forty-fifth and Forty-ninth streets alone. Now the entire work is done automatically by means of what is known as the interlocking switch and signal apparatus. The machinery used is what is known as the Saxby & Farmer system, combining with the Sykes system of electric locks, similar to that used by the Boston and Albany in this city. The new system is expected to be especially valuable from the manner in which all the trains are run into the Grand Central station by what is known as a "flying switch."

The experiments made by Prof. Forbes with wire to determine the thickness required for carrying different electric currents without overheating have attracted considerable attention.

The result of these experiments, according to the announcement, appears to be that if a definite amount of current be carried through a wire of a certain diameter without heating it to a temperature of above 150°, then, in order to carry a current twice as great, without overheating, the wire used must be twice the diameter or four times the section. This, if correct, is considered quite important, the size of conductors being an element largely affecting the cost of a plant for electric lighting, and conductors liable to be overheated greatly increase the cost of the current besides being dangerous.

An Electric Car.

THE INVENTION OF A ST. LOUIS SCIENTIST READY FOR EXHIBITION.

As nothing has been heard recently of the much-talked of electric railway to be exhibited in St. Louis during the fall, a *Globe-Democrat* reporter called at the workshop of the Wellington Adams Electric Company to ascertain what progress was being made in perfecting the new motive power of railway traffic.

The inventor was found with several of his workmen surrounded by whirling wheels and lathes, constituting altogether a complete machine shop, with electricity for its motive power. Car wheels and trucks were laying promiscuously about, and a railroad track traversed the building from one end to the other.

"Are you building locomotives now?" was asked of Dr. Adams.

"No," said he, "not exactly, but we have been so busy with our electric railway that we have been forced to lay our other inventions aside for a while. We have been working night and day to finish an electric railway coach."

"Getting ready for the fall experiment, are you?"

"Well, yes; we want to have it completed by that time, but it is not certain that we will exhibit."

"Why not?"

"Our negotiations have not been satisfactorily arranged. We expect a reasonable compensation for the attraction we offer."

"There is our motive power," said the Doctor, drawing attention to a medium-size narrow-gauge railway coach wheel. Sections of the cavity of the wheel were filled solid with wire, making a weight of 700 lbs. or about 100 lbs. more than an ordinary wheel.

On the same axle to which the wheel is attached there is another contrivance which is driven in one direction by the brushes, and that in turn revolves the main wheel in an opposite course. Each of the track wheels under a coach can be made to produce from 1 to 4-horse power and attain a speed as high as 80 miles an hour. The power current is obtained from a copper tube with a narrow slot extending its entire length, from one end of the track to the other. Within the tube there is an easy-fitting coil of brass plug that is arranged to slide along with the motion of the car, supplying a wire conductor with the necessary current to be applied direct to the driving-wheels.

A model elevated railway car fitted with these appliances was next looked at. It is elegant in design and symmetrical in proportion. At the forward end there is a sort of vestibule, which the passengers enter and alight from, on one side of the coach, immediately under the eye of the conductor, who is also the engineer, who governs the motion by simply moving a polished brass lever to the right or left.

"We carry no dead weight by this system," continued Mr. Adams. "Our wheels won't slip for want of traction to the rails. The weight of every additional passenger fully supplies that want in proportion to the additional power necessary to carry him."

Electric Lighting of Steamers.

The largest contract for electric lighting up to the present time has been concluded to Glasgow between the owners of the New Zealand Shipping Company's fleet and the Edison Company's branch in Scotland, under management of Mr. Charles T. Grant.

Three fine steamers, two of which are sister ships to the steamship Tongariro, launched on last Thursday at Messrs. John Elder & Co.'s yard, are to be lighted throughout with the incandescent light and fitted with a duplicate set of Edison's marine dynamos and engines, one set being for reserve in case of emergency. These steamers, when finished, will be the finest electrically equipped vessels afloat.

The Tongariro and the two sister ships now in course of construction are built of steel throughout, and have cutwater stems with figureheads, which give them a very graceful appearance. They are to be bark-rigged, having masts and yards of steel, with a large spread of canvas, which will be of great service in the trade winds. Each vessel is divided into eight water-tight compartments. Five divisions are carried up between main and upper decks, and fitted with water-tight fire-proof doors giving access from one part of the ship to the other. By this arrangement the danger of fire spreading, should it break out in part of the ship, is checked, and greater safety insured by being able to isolate any one compartment in case of damage to the hull and the compartment being flooded. The vessels are also built under special survey to the requirements for Lloyd's highest class for hull and machinery.

The principal dimensions of these vessels are as follows:

Length between perpendiculars, 380 feet; length over all, 410 feet; breadth, 46 feet; depth, 33' 4", with a gross tonnage of about 4,200.

Passage of the New British Patent Law.

The *Scientific American* says that after prolonged discussion and many amendments the new patent bill for Great Britain has passed both houses of Parliament, has received the royal assent, and will come into force January 1, 1884. We have not yet received the full text of the law, but we are advised by our London correspondent that among its principal features are the following:

A material reduction has been made in the cost of applications for patents, which we roughly calculate will not exceed $100 for the complete patent, including both agency and Government fees for the provisional and final specifications. It is difficult, of course, to say, definitely, what the incidental expenses will be until we can by practical experience ascertain exactly the amount of work involved by reason of the various objections and requirements which may be made by the examiners in each particular case, but we think that the amount named will cover all expenses.

Another feature is the extension of provisional protection to nine months; also to substitution of annual taxes in lieu of the £50 and £100 stamp-duties now charged, the same total amount being, however payable; but the first annual tax not being payable until the fourth year after the grant of the patent. These provisions also apply to patents now in course of application, and also to patents already granted on which the £50 and £100 taxes fall due after January 1st next.

In view of the changes, it will readily be perceived that the new act will give a great impetus to the taking out of patents in Great Britain, for it may be fairly calculated that a proportion of the patents taken out in the United States and in other countries will also be secured in England.

It is not proposed, under the new law, to follow the system of examination as in the United States and Germany, but to adhere to the practice hitherto prevailing in England; that is to say, to issue the patent to the applicant without examination, at his own risk. It is, nevertheless, proposed to create a body of examiners whose principal duties will be to see that the invention described and claimed in the final specification is the same as that described in the provisional, and that the scope of the patent is strictly limited to a single invention.

This is an excellent provision, and ought to be adopted in our law. Our present system of official examination is, practically, a hinderance and an annoyance to the inventor, not a benefit. It delays the issue of his patent, and in many cases involves him in expensive and harassing interference contests, which, after all, decide nothing, as the courts are obliged to review the Patent Office work and determine the validity of the patent. The United States, Canada and Germany are now almost the only countries that pretend officially to examine. In other countries the patent is always granted, and the inventor examines for himself. If he chooses to pay the fees, he may take out a patent; but if it should afterward appear that the invention was lacking in novelty or utility, then the patent is worthless. This is a straightforward system, and works well in all countries where it is in vogue; its adoption here would be a decided improvement in favor of inventors; it would lighten the duties of our Patent Office examiners, and enable them to do better work in respect to those necessary features of examination which the new English law contemplates.

Another important provision of the new English law is that power is taken to conclude international arrangements, so that the publication in England of the foreign specification for a period of six months shall not invalidate a patent applied for during that period; furthermore, the duration of the patent will always be fourteen years, notwithstanding the lapsing of a previous foreign patent of a shorter term.

The Thompson and Houston Electric Company have on exhibit a forty-light plant at the Southern Exposition, Louisville; one of sixty lights at the Pittsburgh (Pa.) State Exhibition; and a twenty-five-light plant at Cincinnati, Ohio.

Rhode Island Electric Lighting Company.

One of the finest equipped electric light plants in New England is at Providence, R. I., and few, if any, who have ever visited it—on a tour of inspection or out of mere curiosity—but come away satisfied that the management are alive to the wants of the public and active in supplying them to the fullest extent. The building is located on Dyer street, near the river, and within a few squares of the business portion of the city. The circuits are therefore short, except when run to distant portions to light factories or mills, and in this way economy has been studied which will insure the financial success of the enterprise only a few months over a year old. Beginning in May, 1882, the company have made constant and substantial progress from the beginning, until now it has one of the best appointed central stations, perhaps, anywhere outside of New York City. In January last the management put in a 175 horse-power new Corliss engine, made especially for this station, which has been christened "Capt. R. C. Brown," in honor of the genial and industrious superintendent of the company. A novel feature, and one not usually employed in electric lighting, is the method of taking the power from the engine direct to the main shaft. This is done by "gearing" the inside of the main driving wheel. A simple gear upon the shaft revolves within this, and a positive power is secured. It is a difficult mechanical arrangement, but when carried out as in this case it gives excellent results.

The company use the electric apparatus manufactured by the United States Company of New York, and have in use eleven Weston dynamos, four 20 and six 10-light machines, and one new 50-light incandescent machine, with the approved circuit indicators complete. There are 127 arc lights in operation, beside the incandescent lights used in the building. The building occupied by the company is 105x60 feet, about two-thirds of which is used for engine, boiler, and dynamo rooms, the remainder for office purposes. The latter is finished in hard pine polished, the office furniture is ash, and the whole presents an elegant appearance under the brilliancy of their incandescent lights.

Mr. Charles Warren Lippet is treasurer, and watches with painstaking care every interest of the company. Captain R. C. Brown is superintendent and general business manager.

The Origin and Principal Function of a Lightning Conductor.*

The celebrated American philosopher, Benjamin Franklin, was led to the idea of the lightning-rod or conductor by the tendency which lightning discharges have for taking place in line with the tops of the spires of churches and masts of ships—in fact, all projecting bodies pointing toward thunder, or rather electrified clouds.

During the year 1749, he made a series of experiments with a Leyden jar by which he found that pointed metallic conductors gave off and received electricity with great rapidity, and when the electricity in the jar was discharged by means of a sharp point, there was not that snapping spark which occurs when the jar is discharged by a ball or the blunt end of a rod.

After detailing the results of these experiments in a letter, dated July 29, 1750, to his London correspondent (Mr. Peter Collinson) for communication to the Royal Society of England, he says:

"If these things be so (referring to the discharging power of points) may not the knowledge of this power of points be of use to mankind in preserving houses, churches, ships, &c., from the stroke of lightning, by directing us to fix on the highest points of these edifices upright rods of iron, made as sharp as a needle, and gilt to prevent rusting, and from the point of these rods a wire run down the outside of the building into the ground, or down round one of the shrouds of a ship, or down her side till it reaches the water?

"Would not these points probably draw the electrical fire silently out of the cloud before it came nigh enough to strike and thereby secure us from that most sudden and terrific mischief?"

The opposite electricities of the lower strata of the air and the surface earth continually recombine silently, principally by the intervention of bodies upon the surface of the earth, such as trees, and particularly those upon the tops of hills and mountains.

When a metallic conductor is well connected with the earth and extends above the highest projecting point of a building it will silently establish the equilibrium between the electricity of the earth and that contained in the lower strata of the atmosphere in the immediate vicinity of the conductor; in fact, a continuous current of electricity will flow over the conductor not only during a thunder-storm, but also during clear weather, and the strength of the current will vary with the potential of the electricity of the atmosphere.

Instances can be cited where there has been a diminution of lightning discharges after the application of lightning conductors to the spires of churches and other high structures.

It has, however, been fully demonstrated that owing to the long distance of most of the thunder-clouds from the earth, their large area and great accumulation of electricity therein, a lightning-rod or conductor with one or more points at its top, also points along its entire length, cannot, as a rule, perform the function, suggested by Franklin in 1750, of silently tapping the electricity contained in a cloud and preventing lightning discharges taking place in the vicinity of the building and particularly one of the ordinary height to which it is applied.

The fact that lightning discharges have quite frequently taken place between thunder-clouds and the tops of lightning-conductors erected upon some of the highest steeples in the world, and which were well connected with the earth, is sufficient evidence that thunder-clouds are generally very high, and that the lightning-conductors cannot always perform the function generally claimed for it by the lightning-rod men and scientists.

The principal object and function of a lightning-conductor therefore consists in furnishing a better path and scope for the passage of the electricity between the clouds and the earth, than the path and scope offered by the objects which are to be protected.

The first lightning conductor ever erected was set up by Franklin himself in September, 1752, and applied to his house in Philadelphia, and, after an experience of fifteen years with lightning-conductors, it became apparent to him that a pointed metal rod could not always perform the function suggested by him in his letter of 1750.

In a paper on lightning and the means for protecting buildings and persons, written by him in September, 1767, while in Paris, he says:

"The clouds have often more of this fluid in proportion than the earth; in which case, as soon as they come near enough (that is within the striking distance, or meet with a conductor, the fluid quits them and strikes into the earth.

"An iron rod being placed on the outside of a building, from the highest part continued down into the moist earth, will receive the lightning at its upper end, attracting it so as to prevent its striking any other part, and affording it a good conveyance into the earth —will prevent its damaging any part of the building.

"Thus the pointed rod either prevents a stroke from the clouds or, if a stroke is made, conducts it to the earth with safety to the building."

DEFECTS OF THE LIGHTNING CONDUCTORS NOW ERECTED.

In determining the requirements of lightning conductors, the manufacturers and erectors have, erroneously, been governed by the action and properties of galvanic and ordinary frictional electricity, and have neglected to thoroughly investigate the large area, action, and properties of the electricity of the atmosphere and earth, and the great quantity contained in the lightning discharges which take place between them. The result is, many of the lightning conductors now erected have no less than four serious defects, and consequently will not properly protect the buildings to which they are attached.

Galvanic electricity has a medium quantity —the term used for indicating the amount of electricity present—and a low potential or tension—the term employed for indicating the property or function of electricity which determines its motion from one point to another. In the electricity generated by ordinary friction, the quantity is small and the potential high, while the electricity of the air and earth when in motion, as in a zigzag or rather spiral lightning discharge, combines great quantity with a very high potential, and is capable of producing effects which cannot be obtained by galvanic or ordinary frictional or induced electricity.

An artificial electrical discharge, produced by a Ruhmkorff coil or Holtz machine, can barely pass through two feet of air or several inches of glass, while a lightning discharge can readily pass through two miles of air and twenty feet of solid rock.

The round iron rods, wire cables, spiral twisted, and other forms of lightning conductors now erected are too concentrated, and as applied to buildings will not allow the electricity in a lightning discharge to have a proper scope, and consequently it will not confine itself to the said conductors, but will leave them for the buildings and their contents, to which they are attached.

A single lightning conductor, as heretofore applied to a building, will, if it contains a suitable quantity of metal and is well connected electrically with the earth, protect that portion of the building to which it is applied, but not the whole building, owing to the great expansive action of the electricity from the clouds and the concentrative and upward action of the electricity of the earth, as they approach and unite with each other, causing strong electrical currents to flow over every part of the building.

Most of the lightning conductors now erected contain a rather small quantity of metal, and are not able to properly resist the heating effect of the electricity in a heavy lightning discharge.

The weight of the wire cable, spiral twisted, and other peculiar and unscientifically formed conductors, varies from .16 to .48 of a pound per lineal foot, and the conductivity of most of them to the electricity in a lightning discharge is about equal to that of a round iron rod $\frac{5}{16}$ inch in diameter, which is not sufficient for safely conducting a very heavy charge of electricity, and fully resisting its heating effect. The quantity of metal should not be less than that contained in a round iron rod $\frac{7}{16}$ inch in diameter, which weighs .50 of a pound per lineal foot.

As the wire employed in an ordinary electric arc light circuit must not be less than No. 5 Wire Gauge in thickness, it is quite evident that the quantity of metal employed in the lightning conductors now erected is entirely too small, as the latter are subject to currents of electricity of much greater intensity than those generated by a dynamo-electric machine.

The electricity of the clouds and earth have a very strong tendency toward each other, particularly when in close proximity to each other while uniting in a lightning discharge, and will not follow a metallic conductor or path when it is an indirect route about a building.

The arrangement of conductors shown by the heavy lines along the ridges, gables, and eaves of the roof of building in Fig. 1 is defective, and will not afford proper protection to the roof.

A lightning discharge taking place in line with the pointed metallic coping, *A*, upon the top of the right-hand chimney, is expected to follow the indirect route *via* the metallic conductors *C*, *D*, and *E* along the ridge, gable, and eave of the roof between the chimney conductor *B* and the vertical conductor *F*, which leads from the eave of the roof to the earth, while really it will take the more direct route, shown by the dotted line *G*, over the wooden rafters and sheathing of the roof between the conductors named. A large iron ball projected from a cannon with great force, might as well be expected to take such an indirect route.

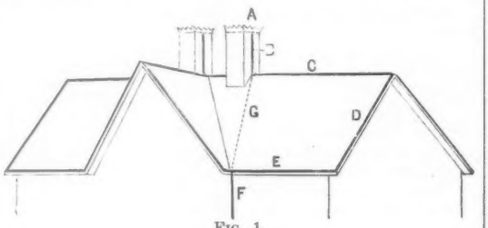


FIG. 1.

The routes of many of the lightning conductors now erected are very indirect, and particularly along the roofs of buildings, and consequently they will not effect safe passages for the electricity in lightning discharges.

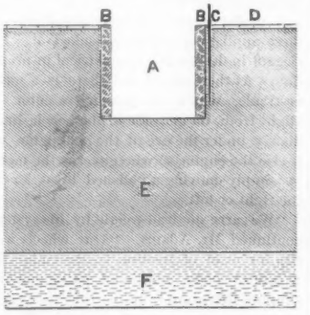


FIG. 2.

In addition to the improper construction and application of lightning conductors to buildings, they have not been placed in the earth to a suitable depth, thereby proventing the electricity from the clouds from readily uniting with the electricity of the earth, which is principally accumulated in the subterranean water-bed and not in the surface earth, as has been generally supposed. Many of the conductors now erected terminate in the earth from two to seven feet, alongside the foundation walls of buildings, as shown in Fig. 2, and have, on an average, a metal surface of only eight inches square in contact with the earth.

It has generally been supposed that at the depth of about six feet the earth adjacent to a building is in a moist condition during the summer season, but such is not the case. Rain is generally prevented by the building from falling near the foundation walls, and by the pavement, *D*, from penetrating the earth to a suitable depth; and, owing to the long intervals of rain and the excessive heat of the sun, the small quantity of rain that may have entered the earth near the lightning conductor *C*, during a summer-shower is soon afterward dried up. The earth, *E*, beneath the cellar, *A*, and pavement, *D*, is kept in a rather dry condition for a considerable depth, which, together with the poor conductivity of the stone wall, *B*, greatly impedes the passage of the electricity in a lightning discharge between the conductor, *C*, and the subterranean water-bed or permanent moisture, *F*, or *vice versa*.

If a river is dammed or cut off from shore to shore, except a single passage about a foot wide, there will naturally be a great obstruction to the current thereof; a great accumulation of water will take place, which can only find a suitable outlet to the water below the dam by overflowing the adjacent territory or violently breaking away the dam. A similar but more violent effect takes place when the electricity from a cloud alights upon a metallic or lightning-conductor, the lower end of which is disconnected from the earth or is separated from the subterranean water-bed or permanent moisture by dry earth or solid rock The said electricity being greatly retarded in its passage, is compelled to seek some other outlet and it invariably leaves the metallic conductor above the surface earth, and spreads out over the building and its contents in order to readily unite with the electricity of the earth. In a number of instances the electricity has also left the lower end of the lightning-conductor, *C*, and passed through the foundation wall, *B*, into the cellar, *A*, and over some of its contents.

It has been asserted by some scientists that water and moist earth are poor conductors of electricity in a lightning discharge. Their opinion is based upon the comparative amount of resistance that is offered by water and metals to a galvanic current, which is electricity of a low potential. It must, however, be borne in mind that the electricity in a lightning discharge is of a very high potential, and can readily overcome the resistance offered by water or moist earth. The moist routes selected by lightning discharges while passing through the air, over buildings, and in the earth, and the fact that well-moist earth is not torn up thereby, fully demonstrate that water and moist earth offer an easy path for said electricity, when a suitable quantity is present.

In order to effect a proper electrical connection, the lower terminal of a lightning-conductor should be in the earth to the depth of at least ten feet, and have not less than six square feet of metal surface in contact with well-moist clay, gravel, or sandy soil.

It is principally owing to the small quantity of metal contained in the earth terminals of the lightning-conductors now erected, also the dry condition and poor conductivity of the earth and stone walls around and beneath them, that they cannot be relied upon for the safe passage of electricity in lightning discharges to or from the earth.

La Nature describes an electric curiosity invented by a Dr. Claudet. A flannel to cure or alleviate rheumatism is the article. It contains, per kilo, 115 grams of the oxides of tin, copper, zinc, and iron. A series of threads of this fabric is impregnated with these metallic products, and each series is alternately separated by raw threads. The flannel thus prepared constitutes a true dry pile. It is said to develop electricity by simple contact with the body; or, better still, with the products of perspiration.

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* From Spang's new and revised treatise on Lightning Protection.

Telegraphic.

The Western Union Report.

THE OFFICIAL STATEMENT ISSUED BY THE BOARD OF DIRECTORS.

The Western Union Telegraph directors met on Wednesday last and declared the usual quarterly dividend of 1¾ per cent. The following is the official statement:

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, Sept. 12, 1883.

The following statement will show the condition of the company at the close of the quarter ended June 30th, 1883:

Surplus, April 1, 1883, as per last quarterly report.....		$3,545,242 50
Net revenues, quarter ended June 30, 1883.....		1,639,897 02
		$5,185,139 02
From which deducting appropriations for—		
Dividend of 1¾ per cent., payable July 16....$1,399,768 02		
Int. on bonded debt..... 106,805 50		
Sinking funds. 20,000 00		
		$1,526,573 52
Leaves a surplus, July 1, 1883, of.....		$3,658,566 00
The net revenues of the quarter ending September 30, instant, based upon nearly completed returns for July, partial returns for August, and estimating the business for September, will be about		$1,650,000 00
Add surplus, July 1, as above		3,658,566 00
		$5,308,566 00
From which appropriating for—		
Int. on bonded debt.....$106,700 00		
Sinking funds . 20,000 00		
		$126,700 00
Leaves a balance of.....		$5,181,866 00
It requires for a dividend of 1¾ per cent. on the capital stock.....		1,399,779 42
Deducting which, leaves a surplus, after paying dividend, of.....		$3,782,086 58

The full returns for the quarter ended June 30, complete the figures of traffic for the fiscal year, showing gross revenues for the year ended June 30, $1,454,902.98; expenses, $11-794,553.40; and net profits, $7,660,349.58, being an increase over the previous year of $2,340,737.06 in gross revenues, and of $542-279.58 in net profits.

In view of the preceding statements, the committee recommend the adoption by the board of the following:

Resolved, That a dividend of 1¾ per cent. on the capital stock of this company be hereby declared payable on and after October 15, and on removal of legal restraint prohibiting such payment, to stockholders of record, at the close of transfer-books on the 20th of September, instant.

Resolved, That for the purpose of the annual meeting of stockholders, to be held on Wednesday, the 10th of October next, and of the dividend hereinbefore declared, the stock books of the company in New York and London be closed at 3 o'clock in the afternoon of the 20th of September, instant, and be reopened on the morning of the 16th of October next.

Respectfully submitted,
NORVIN GREEN, President.

Mr. J. Lowber Welsh, of Philadelphia, resigned as a director, and Mr. C. C. Baldwin, president of the Louisville and Nashville Railroad, was elected to fill the vacancy.

Articles of incorporation of the Underground Conduit and Pneumatic Delivery Company were filed on Thursday last in the County Clerk's office. The capital stock is $2,500,000, and the corporators are H. H. Wainwright, Joseph F. Hagen, and H. S. Dugan.

The First Through Telegraph.

VICKSBURG, MISS., September 8.—The first through telegraph over the line of the Louisville, New Orleans, and Texas line was received from the northern boundary, Sharkey county, a district of fifty-seven miles north of this city. The road has now a continuous line from Port Gibson to the northern boundary of Sharkey county, of eighty-seven miles.

A Cable for Cochin-China.

The recent operations of the French in Tonquin have directed public attention to that part of the globe; but it is not generally known that the Eastern Extension Telegraph Company have for some time past made arrangements for laying a submarine cable between Tonquin and Cochin-China. It was intended to lay the cable from Saigon, where communication already exists, and Hai-Phong with a branch into Hanoi. Unfortunately, however, the French Chamber has rejected the proposals of the English company in favor of a less advantageous offer by M. Blanscube, Deputy of Cochin-China. The Colonial Council of that possession have proposed to share the expense of constructing the new line, which there is every reason to believe will be made by French manufacturers and laid in French territory.

S. W. Fullerton, President of the New York Commercial Telegram Company, says that it will defend every suit brought by the Gold and Stock Telegraph Company which claims infringement. Mr. Fullerton says the instruments are owned and operated under letters patent of the United States, and do not infringe on any existing patent.

The new superintendent of the Western & Brazilian Telegraph Company's offices of this city, William Slater, Esq., has arrived and taken charge. The company has recently made an important reduction in its rates so as to compete with the land lines, a step that should have been taken long ago. The new rates are to go into effect on the 1st of September.—*Rio News.*

Postmaster General Fawcett's Annual Report.

SOME INTERESTING FIGURES SHOWING THE EARNINGS OF THE DIFFERENT BRANCHES OF GREAT BRITAIN'S POSTAL SYSTEM.

WASHINGTON.—The last annual report of Mr. Henry Fawcett, Postmaster General of Great Britain and Ireland, for the fiscal year ended March 31, 1883, which was completed and submitted on the 14th of last July, has just reached the Postoffice Department here. The report contains much that is interesting concerning the growth, extension, and operations of the different branches of this important service in Great Britain during the last fiscal year.

Mr. Fawcett says at the outset that the business of the department continues to manifest satisfactory progress. The gross revenue of all branches of the department was £9,413,812, and the total expenditure amounted to £6,352,064, leaving a net revenue of £3,061,748, which is £38,727 less than the net revenue of the preceding year. The estimated number of letters delivered in the United Kingdom during the year was 2,280,636,200 an increase of 4.2-10 per cent., of postal cards 144,016,200, an increase of 6 3-10 per cent., and of newspapers 140,682,-600, being slightly less than last year. The decrease in the number of newspapers passing through the mails is attributed to increased facilities offered by railway companies for sending newspapers as parcels. It is estimated that the average number of letters per head of population was: In England and Wales, 40; in Scotland, 30; in Ireland, 16, against 21 in the United States, 15 in France, 13 in Germany, and 6 in Italy and Spain. It is mentioned in the report that one firm in London posted as many as 132,000 letters for a single dispatch, and another firm 167,000 postal cards. Heavy postings of circulars by individual firms, ranging from 144,000 to 456,000 in number, are also mentioned.

The number of postoffices in the United Kingdom is 15,406, and the total number of persons in the department holding permanent situations is about 44,600. The list of retired officers in receipt of pensions shows a total of 3,335, whose pensions amount to £176,826 a year. In addition to these, about 41,000 persons are employed by local postmasters, most of whom have other employment, and are engaged on postal duties during only a portion of the day.

The operations of the telegraph department are summarized as follows: Number of messages transmitted 32,092,026, an increase of 746,165 over the previous year. The number of messages sent in London was 12,374,707, an increase of 303,673 over the previous year. One hundred and forty-seven post offices and railway station offices were opened for telegraph work during the year, making the total number of telegraph offices 5,742. The gross revenue from the telegraph service was £1,740,063, against £1,630,443 for the previous year; but, owing to a considerable increase in the working expenses of this branch of the service, the net revenue for last year was but £235,570 against £264,-810 in 1881-82. A reduction in the minimum charge for inland telegrams from 1s. to 6d. is contemplated, and will be made as soon as the necessary increase of plant can be effected.

The Bankers and Merchants Absorbs a Southern Rival.

RICHMOND.—Much satisfaction is expressed in business circles here at the consolidation of the Southern Telegraph Company with the Bankers and Merchants' Telegraph Company, since it improves the prospects that the indebtedness of the former company will now be liquidated. It is said that the men who have been building the lines have not been paid for four months; that the company owe their officers considerable sums, and that the line material has been attached for freight and other bills. The gang of men employed on the lines between Charleston and Columbia repeat the same story of the operations on that railroad. It is believed that the new organization will see that these liabilities are discharged.

The *Christian Union* says that the New York *Herald*, which has taken up the cause of postal telegraphy in earnest, contains two columns of extracts from the press, showing how decided and rapid has been the growth of public sentiment in this direction within the last few weeks. The New Hampshire State Legislature has passed a joint resolution in favor of such a system. The indications are that the Georgia Legislature will pass similar resolutions, and we judge that the general public sentiment throughout the country is fairly represented by the Richmond *Express* of Virginia, which, declaring that the adoption of a national system of telegraphs, to be owned and controlled by the Government, is unavoidable, adds: "We appreciate its dangers, foresee its benefits, and are prepared to accept the latter and to try to avert the former." The public will look with interest and perhaps with some suspicion upon the action of the next Congress on this subject; with suspicion lest the interests of the capitalists shall outweigh those of the public in Congressional action.

Notices were served yesterday by the Gold and Stock Telegraph Company on brokers using the stock-printing machines of the Commercial Telegram Company saying that they were infringements on the patents of the former company. Suits, it was stated, had been begun against the company. Persons using the instruments were liable, as well as the company, and suits would be begun against them if their use was not discontinued. The Commercial does not have the privilege of the Stock Exchange floor. Only about twenty of its instruments have been put in, and it has not fairly begun operations. The Gold and Stock pays $18,000 a year for the Stock Exchange privilege.

Meeting of Telegraph Directors.

BOSTON, Sept. 14.—An important meeting of the directors of the American Rapid Telegraph Company was held to-day. A. W. Dimock, John R. Hageman, G. S Mott and G. Putnam Smith were added to the Board of Directors, in fulfillment of an understanding whereby the men controlling the Bankers and Merchants' Telegraph Company are to control the American Rapid. Mr. Dimock, who is now president of the Bankers and Merchants' and the Southern, will, it is stated, take the presidency of the Rapid, and Mr. G. S. Mott, general superintendent of the Bankers', will extend his supervision over the three systems. While no actual consolidation between the Rapid and the Bankers' has taken place, the admission of Messrs. Dimock, Mott, Hageman and Smith to the directory of the first-named company practically places that company in the hands of the Bankers and Merchants' stockholders. The $3,000,000 of bonds of the Rapid Company, which are to be issued for the purpose of extending the lines of that company to Chicago, St. Louis and the Southwest, will be taken up principally by the Bankers and Merchants' people. Besides the four directors elected yesterday, the directory of the Rapid Company includes J. W. Converse and Frank Morrison, of Boston; Frederick H. May and A. H. Barney, of New York; and George B. Chandler, of Manchester. By the combination of the Rapid, Bankers' and Southern systems, it is alleged that messages will soon be sent as far west as Chicago and St. Louis, and south to Savannah and Charleston. Six new wires of the Bankers' line are being stretched between New York and Washington.

Wires Underground in Washington.

WASHINGTON, Sept. 14, 1883.

The Commissioners of the District have signed a contract with the Standard Cable Company of New York, under which the latter is to put the Government telegraph line connecting the Executive Departments with the Capitol underground.

The commissioners have recently permitted the telephone companies to string some wires in the alleys temporarily, under an agreement that they will be taken down at sixty days' notice. But they have determined that the poles must go. It is merely a question of time. The Standard Cable Company will begin work next week. The commissioners will await the action of the committee of experts, now sitting in New York, before committing themselves to any one scheme.

The friends and acquaintances of G. P. Hubbell, formerly manager of the Western Union Telegraph Company at Hartford, will be pained to hear of his death, which occurred at that place on Friday the 7th inst. Mr. Hubbell was well and favorably known in the electrical field, and greatly appreciated for his genial qualities and courteous demeanor, he formed many very strong friendships. The Common Council of Hartford, of which he was a member, passed the following resolution at a special meeting:

COURT OF COMMON COUNCIL,
City of Hartford, Sept. 6, 1883.

WHEREAS, Death has removed from the activities of this life Gershom B. Hubbell, a valued member of this court of common council; therefore resolved:

I. That in his death the City of Hartford loses an honest and faithful public servant, and this community a man who had, and fully merited by his pure and upright life, the confidence and esteem of his fellowmen;

II. That we extend to his bereaved family our heartfelt sympathy;

III. That, as an expression of our affection for his memory, we will attend his funeral in a body;

IV. That a committee, consisting of two aldermen and four councilmen, be appointed to accompany the remains to Bridgeport for burial;

V That His Honor the Mayor be and he hereby is directed to forward an attested copy of these resolutions to the family of our late associate, and that they also be spread upon the journals of this body. Resolutions were also passed by the board of fire commissioners.

Telephonic.

Cleveland (Ohio) and Its Telephones.

[For the REVIEW.]

Cleveland is the second city of Ohio in importance and population, and is the most beautifully situated of any of them.

It stands on high land on the south shore of Lake Erie, and has a good harbor constructed round the mouth of the Cuyahoga River.

It is a peculiarly interesting city from an electrical point of view, being the headquarters of the Brush Electric Light Company and the home of the inventor Brush. This is brought home to the traveler very forcibly as he walks the streets of Cleveland after dark and sees the profundity of the electric light, and finds that even when he is traversing a street where there are apparently no lamps of any kind, a kind of luminiferous ether pervades the entire atmosphere, and he can see all around him.

By and bye as he proceeds he finds that the all-pervading twilight emanates from an extremely high mast which carries at its apex eight brilliant electric lamps. These masts are placed at various central points throughout the city, and transform the night not into day, but into gloaming.

The streets of Cleveland are wide, the principal business avenue (Superior street) being 150 feet wide, while Euclid avenue, the principal residence thoroughfare, is at least an equal width, and looks much wider from the extraordinary amount of lawn which stretches out in front of each house.

The lake is a perennial fount of beauty and benefit, and an elegant little park has been constructed along its banks where the visitor may sit and enjoy the landscape or rather the waterscape to his heart's content.

We often think during a storm of the dangers of the ocean, and pity the tempest-tossed mariners; but quite forget the dangers of the fresh-water lakes. Yet I have seen the waters of Lake Erie after a gale breaking 40 feet on the shore, and have seen wrecked vessels drifting up on the shores in number, for in addition to the ordinary dangers of the ocean, the serious element of a lack of sea-room is superadded in the navigation of the lakes.

As a telephone center Cleveland takes high rank. As all readers of the ELECTRICAL REVIEW are aware the property of the Cleveland Telephone Company was recently purchased by the Lowell telephone syndicate and consolidated with the Northwestern and Southwestern properties to form the Erie Telephone Company.

Its former general manager, however, Mr. James P. McKinstry, still holds the ribbons at Cleveland as superintendent of the Cleveland division; while C. P. Wainman maintians worthily the position of chief operator, which he has held from the inception of the company in the summer of 1879, Mr. James Kilby acting as his assistant.

While almost every other important telephone exchange has changed its central office and paraphernalia half a dozen times, Cleveland still has in use the same switches used at the opening of the exchange. Others have, of course, been added.

It is said that the population of the city is now close on 200,000. This is scattered over a large and wide territory, and it has therefore become almost a necessity to have more than one large central office.

There are accordingly three auxiliary offices called stations A, B and C.

The main central office, No. 158 Superior street, is well put together, great credit being due to Mr. Wainman for the arrangement of the apparatus and circuits, which with the old material which was all that he had at his command, was a matter of some difficulty.

Most of the line wires leading in to this office are single conductors, and are of No. 11 galvanized iron wire.

Yet five cables are in use, all of the Western electric make, and which have a capacity of 50 wires each. Four of these are about 250 feet long, and the other 500 feet. Altogether 850 lines enter the central office. The outside construction here is of the strongest kind, high and strong poles having been used, and as little housetop construction as possible having been put up. The lines and cables all enter a cupola which surmounts the building, and each line is screwed into a metal bracket which on one side terminates in a point, which projects near to a massive brass bar common to a number of circuits. This is the lightning arrester ground plate, and the metal bracket thus serves the double purpose of line terminal and lightning arrester.

It was a great satisfaction to the writer to see the solidity of the lightning arresters and ground wires, believing as he does, that destruction by lightning might often be prevented by a sufficiently large ground wire.

The central office switch-board consists of 24 sections, some of which are the old Scott universal, some Jones and some Weston electric; most of these sections have a capacity of 40 lines.

Twenty-nine young ladies and one solitary boy manipulate these tables during the daytime; one of the said young ladies being devoted exclusively to the out of town lines of which there are ten.

Three lines run to Akron, a distance of 40 miles; one to Chagrin Falls and Youngstown; one to Ravenna direct; one to Bedford and Hudson, Ohio; two to Painesville and Ashtabula, and to Elyria and other places West.

The office called station A is located at the corner of Cedar and Grant, and all the line wires are led in through cables. In this office the lines after passing through the lightning arresters are connected with office cables by which the lines are led direct to the switch-board, which consists of six 50-line Jones boards, each of which is manipulated by a young lady.

Station B is over the Cuyahoga River on what is called the west side. Its arrangement is much the same as that of station A, but with only five switchboards instead of six.

Station C is at No. 187 Ontario street, and is furnished with seven 40-line sections of Weston electric switchboard, affording present facilities for 240 lines.

There is one particular feature in the operation of the Cleveland offices. Each switchboard is connected with each distant switchboard, whether in the same or in another office by one or more trunk lines in either direction.

There is also a calling line on which trunk orders are transmitted. Orders coming in to any desk or office are received by a special operator and are then verbally given to the switching operator. Orders going out are on the contrary sent directly by the switch-board operator. The special operator has also in the case of the branch offices charge of the room. Connections between one switchboard and another, and also between one office and another, are thus very rapidly made. PSGOASSH.

At a meeting of the Suburban Telephone Company at Lowell, Mass., September 11, it was voted to abandon the scheme for a consolidation of the New England companies, and it was also voted to increase its capital to $175,000 for construction purposes.

The Bay State Telephone Company has taken a similar action in regard to a consolidation, and has voted to increase its capital to $200,000. Both companies report a large increase of business in their territory.

The Chesapeake and Potomac Telephone Company, under the able management of General Manager Lytle, are rapidly covering that region with new territorial and private lines, and new points are daily being brought into the circuits, which are being constructed where the telephone has not hitherto been known. We predict a marked success in this district under the new plan. Work in the direction of opening has already commenced at Annapolis, Westminster, Elkton, and other county seats, from which lines will be built covering the entire counties.

The Empire State Telephone and Telegraph Company.

HUNDREDS OF MILES OF WIRE IN USE — TOWNS IN NEIGHBORING COUNTIES THAT ARE CONNECTED — THE FIRE ALARM SYSTEM.

A Seneca Falls letter in the Syracuse *Sunday Herald* says:

The telephone as well as the telegraph has become so important a factor in the gathering of news and in the transaction of business that all matters connected therewith are of interest to most readers.

The telephone system of the cities is well understood, but the system which is being introduced throughout the rural districts is perhaps not so familiar.

The Empire State Telephone and Telegraph Company is, perhaps, a typical specimen of the progressive Americanism of the age which is spanning the highways and byways of the country with "talking wires." This company was organized about three years ago to put in local exchanges at Auburn, Seneca Falls and Waterloo. Geneva was afterwards ambitious enough to have an exchange.

Within a few months Mr. H. L. Storke, of Auburn, the stimulating genius of the organization, conceived the plan of uniting these places, and he carried it into effect about two years ago, affording each subscriber the advantage of the extended connection, saving a slight tariff for the use of the trunk line. A few weeks later the line was extended to Moravia, and since then the net-work has spread with marked rapidity.

Starting at Auburn, there are offices at Oswego, Fulton, Cortland, Homer, Aurelius, Cayuga, Seneca Falls, Waterloo, Geneva, Shortsville, Clifton Springs, Castleton, Orleans (Canandaigua) and one at Penn Yan to be connected immediately with Canandaigua by a line running through Rushville.

From Auburn is the branch to Ensenore and Moravia, and another to Port Byron and Weedsport. At Cayuga a branch runs to Union Springs and Aurora. From Geneva a line runs to Lyons, thence connecting with Newark, Palmyra and Clyde, finally to run onward to Victor.

The railroad offices at Hoyt's Corners and Willard are connected by the wires of the Empire Company, and these points, as well as a new office at Ovid, will soon be connected with the trunk lines at Geneva.

It will thus be seen that the *Herald* office at Seneca Falls has a reach of 30 miles to Moravia through Auburn—nearly the same distance to Weedsport and Port Byron; more than 40 miles by the line *en route* to Canandaigua, with a prospective extension of 20 miles to Penn Yan, and more than 70 miles of line through Lyons and intermediate stations to Victor; the entire radius covered being the principal part of Cayuga, Wayne, Seneca, Ontario and portions of Monroe and Yates Counties.

The trunk line of wire is more than 200 miles long, and there are exchanges at Auburn, Seneca Falls, Waterloo, Geneva and Canandaigua, while the central offices at Geneva and Seneca Falls also have fire alarms, making connections with the local engine houses

The general office of the Empire State Company is at Auburn, with officers as follows: President, H. L. Stokes; vice-president, D. A. Smith; secretary, George Underwood; treasurer, James Seymour, Jr. F. C. Timpson is assistant general manager, having an active superintendent of construction in Alexander Trimble of Auburn. Edward F. Slack of Waterloo is superintendent of the section west of Auburn, and has developed the territory and handled the business with marked skill. The offices of the company at the various stations are operated as follows:

Auburn—A. Underwood, manager; Miss Fitch, Miss Lynch, Miss White, Miss Smith, day operators; W. F. Betts, night operator; Richard Tracey, relief. Seneca Falls—Miss Nellie Page, operator; Miss Nellie Adriance, relief. Waterloo—Miss Alice Batsford, clerk and operator; Miss Lida Vandenburg, relief. Geneva—Miss May Gaylord, operator; James Durkin, relief and night operator. Shortsville—F. Schlick. Canandaigua—W. S Smith, manager; Miss Hattie Spencer, operator; at Moravia, B. M. Hyde is operator; Port Byron, Mr. Huff; Weedsport, Mr. Todd; Ensenore, George Clark; Troupsville, Mr. Van Aken; Union Springs, J. R. Everett; Cayuga, J. J. Costello; East Bloomfield, Mr. Appleton; South Bloomfield, Mr. Simmons; Bristal Center, Mr. Case; South Bristol, Mr. Allen; Bristol Springs, Mr. Hemingway; Seneca Point, Mrs. Cook; Woodville, Mr. Standish; Naples, Mr. Cramer; Baptist Hill, Mr. Simmons; Honeoye, Mrs. Frank Kline; Hemlock Lake, Mr. Morton; Livonia Center, Mr. Patchen; Livonia Station, Mr. Fox At Clifton Springs, the office is in the sanitarium. From Canandaigua, on the "Peanut road," the line reaches Miller's Corners, West Bloomfield, North Bloomfield, and Honeoye Falls, and there is also a station at Lapham's Point, on Canandaigua lake, the summer residence of Senator Lapham. Reaching Miller's Corners, the Empire company are within eight miles of the "Buffalo Telephone Company," which gap will be filled and a complete connection made with Rochester.

The task of laying out this line and establishing the numerous offices during the three years in which the company has been in existence can scarcely be comprehended. The company originally located their lines on the roofs of houses, but have since erected poles, and transferred their wires—the poles being neatly painted and made an ornament rather than an unsightly object—to the highways. There are now two trunk wires between Auburn and Waterloo, and this increased service will soon be extended to Canandaigua.

The fire-alarm system, which has been established in Seneca Falls and Geneva, has proven very successful. The central office has a connection with every engine-house, and in Seneca Falls with the residence of each member of the paid department, and the alarms are promptly given. So effective has been the system that no considerable loss by fire has occurred in either place since its adoption. It is probable that Auburn and the principal villages having "exchanges" in the circuit will adopt the fire-alarm system.

The company now has in its circuit between 700 and 800 instruments, and additions are being made daily. Mr. Slack, who has favored the *Herald* representative with many facts, expresses the utmost confidence that the utility of telephone communication throughout the entire extension contemplated by the company will be perfect. Certain it is that no difficulty is now experienced by an adept in telephoning who desires to reach the most remote point on the line. The operators and linemen of the company number about one hundred, and it is an unusual thing to hear any criticism upon the character of their service. The operators are patient and intelligent, and the company has a reputation for the good service it renders its patrons, which is the secret of its success, and might be cited as an example for some of the city lines to follow.

Terrestrial Telephoning.

It is said that M. Ritter, an eminent Bavarian philosopher and electrician, in the month of May, 1805, communicated to the Royal Academy of Sciences of Munich the fact of successfully magnetizing pieces of gold by Voltaic electricity. That gold needles or compasses when thus magnetized "obeyed terrestrial magnetic influences for several months, displaying directive qualities," etc. And William Sturgeon, a learned scientist and author of that period, was led to make the following remarkable statement, the truth of which has recently been demonstrated at Washington. Professor Sturgeon says: "This simple process of exciting electric currents, when transferred to the vast apparatus of nature, opens to view the most magnificent theory of terrestrial magnetism that the mind of man can possibly conceive. The sun would thus become the exciting agent, whose uniform tide heat, sweeping the tropical zone, would be productive of an immense westerly circumflowing electrical flood, and convert this terrestrial globe into a grand thermo-electric magnet.

"Thus the earth may be considered as an

equivalent to an immense pile of Volta, of which the poles are on one side sufficiently closed by the waters of the ocean. The action of this pile has produced great chemical changes in the materials of the earth—changes which have differed according to the poles, and of which pile the poles at the other extremity have always such an abundance of electricity as to cause its splendor to appear in magnetic radiations in the vast spaces in the heavens, and usually termed Aurora Borealis."

The foregoing magnetic principle of our earth has remained unchanged for centuries prior to the appearance of human life upon the planet. Then, when comparing the progress of electrical science of the present with the past, the gain has been slow indeed. Professor Morse often spoke of the earth's magnetism, and in his experiments in 1844, operated a galvanometer attached to plates of metal in the earth, by sending a powerful current of electricity across a stream of water. So, too, will the telephone of to-day receive and transmit signals or sounds of various kinds by powerful batteries connected to the earth without the use of wires, on this terrestrial telephonic principle of the magnetism of the earth and atmosphere.

The principle of the magnet is little understood; and now, when the telephone has only been in operation a few years, and hundreds of thousands of magnets formed and used in all manner of shapes and sizes, is it any wonder that we should be so anxious to learn all about the law of magnetism that pervades each magnet handled, whether in the telephone or other electrical device?

The two new lines recently built by H. B. Lytle and H. P. Frost, between Washington and Baltimore, of No. 4 copper wire, has been purchased by the Chesapeake and Potomac Telephone Company. The company will open these two trunk lines for use at once.

Harry Leavitt is the competent night operator in the telephone exchange at Brattleboro, Vermont. One hundred and sixty subscribers make more than a respectable exchange for the beautiful village on the hills. Wires have recently been run to Keene, N. H., and telephonic communication opened between the two places.

A direct telephone line from Willimantic to Norwich is in process of construction, and will soon be completed.

Manager Charles W. R. Dow, of the telephone exchange at Norwich, Conn., has recently met with some hard luck and considerable loss. His residence at East Great Plain was entered some nights ago by supposed burglars, and silverware, dishes, etc, stolen. On the following morning, after careful search and investigation, the stolen property was found in the barn and outhouse badly damaged. Their removal was the work of a drunken and maliciously-inclined person.

Editor of the Electrical Review:

SIR,—Having seen in your paper of Sept. 6th an article entitled "Electrified Liquor," and claimed to be the latest novelty invented by a Californiah; in answer to the above I would beg to state that the process of passing a current from the dynamo through new wine to make it old, was tried in the St. Lawrence Hall, Montreal, by the manager, Mr. S. Montgomery, in the month of June 29, 1882. The electrical connections were made by me at that time, and the dynamo run under my supervision.

An insertion of this letter in your valuable paper will greatly oblige yours respectfully,

JOHN SMILLIE,
Engineer St. Lawrence Hall,
Montreal, Canada.

Montreal, Sept. 9, 1883.

How thankful we should be if the Lord would only spoil us by giving us so much good fortune that we should become mean and parsimonious!

The managing electrician of the electric light company, Lowell, Mass., narrowly escaped death recently. He was inspecting the dynamos, which were in full motion, and was regulating the screw of the brushes, when he slipped on the oily floor. In falling he kept hold of the screw with his right hand, and with his left instinctively clutched the dynamo opposite to save himself. At once the full force of the twenty-five horse-power current, strong enough to have killed several men, passed through his body. He fell apparently lifeless, but was restored by hard rubbing. He suffers no pain, but is filled with an indescribable sense of weakness.

This year the largest single bondholder the Treasury Department knows is Mr. Vanderbilt, who will receive the interest on $37,000,000; a year or two ago he had $50,000,000. The next largest owner is Mrs. A. T. Stewart who has about $30,000,000. Mr. Gould has $13,000,000 in registered bonds and a large number of coupon bonds. A California millionaire has $15,000,000. An estate in Boston and three or four persons in New York have each $10,000,000, and a lady in New York (unmarried) has $8,000,000. The estate of Moses Taylor in New York has $5,000,000, and D. O. Mills (Whitelaw Reid's father-in-law) $4,000,000. The house of the Rothschilds holds nearly one-quarter of America's whole bonded debt, as, including all the bankers of that name, they have $400,000,000. Lady Hannah de Rothschild, who married the Earl of Rosebery a year or two ago, brought to her husband $20,000,000 in American four and one-halfs.

The American Spiral Wire Company report that they have six experimental lines of their wire in operation in Pennsylvania, one in New York State, five in Massachusetts, including the special Boston and Lowell wire now about completed; two in Rhode Island, and one in Louisiana. They will use a Day-Kerite wire in crossing the Chelsea River on their line between Boston and Lowell.

The quarterly report of the Western Union for the three months ending September 30, partly estimated, as compared with the same period of 1882, gives an approximate idea of the losses sustained by the company on account of the recent strike. The net reveuues show a decrease for the current quarter of $679,477; to this should be added 10 per cent., which was about the average yearly increase heretofore, which makes a total loss in revenues of $747,424.

During the strike it was claimed that the company would not lose as much as reported as the expenses would be less, but the comparison of the surplus of the two quarters of 1883 and 1882 show a larger loss than on net revenues, from which it appears that the expenses have been correspondingly increased. The surplus for the quarter of 1882 was $1,003,007, while for the current year it was only $123,521, a loss of $879,228. The latter amount includes the increased dividends of $200,159.

It will be with a great many of us as it was with old Hans in his dream. He dreamed that he was at the bar of justice trying to find some good reason why he should not take his place with the goats, when the Lord took pity on him and said:

"Well, Hans, you may go over dere on de right mit de sheep, but I want you to understand dat it's a mighty tight squeeze."

We are never at a loss for a good excuse for our evil deeds, and resemble the eloquent darkey who said to the Judge: "Judge, I was sufferin' awful from 'motional sanity, cos, don' yer see, I only took dat little pullet w'en I might a took a big rooster. But, Judge, I 'strained myself an' didn' do it, an' I ought ter be let off."

Sin always manages to betray itself, like the beggar who, when suddenly asked how long he had been a deaf mute, answered "one year."

Armies, says a writer in the *Edinburgh Review*, are now so organized that they can keep the field without the intermission of the season; they can be moved great distances with extreme celerity; they are furnished with terrible means of destruction, the formidable inventions of modern science; they are trained to march, to manœuvre, to fight, with an efficacy which, in the days of Froissart, would have seemed beyond the capacity of man, and they are composed of multitudes which a Du Guesclin or a Talbot would have pronounced impossible. On the other hand, civilization has made the natural defenses of a country weaker; the multiplication of roads and bridges has facilitated the advance of an enemy; the diminution of the power and number of fortresses has had a like result, and the improvement of agriculture, by increasing the means of subsistence for an invading army, has operated in the same direction. War in the fourteenth and fifteenth centuries was carried on in a very different fashion, and in character and effects was wholly dissimilar. Armies were still, in the main, the feudal militia; they were on foot only a few weeks in Summer; their movements were pitiably slow and limited; their artillery and arms were cumbrous and feeble; their operations were rude, imperfect, and seldom produced decisive effects, and, compared with the hosts of the present day, they were no more than a handful of men. Again, a country in those days presented great and various obstacles to an invader; the roads were few and bad, and the large rivers were bridged only at wide intervals; every avenue was guarded by feudal castles, and every town was a kind of fortress; woods and marshes barred an invader's progress; and owing to a backward state of husbandry a hostile army was often unable to obtain supplies in its line of march, and was paralyzed or compelled to retreat. Offensive operations are thus favored to an extraordinary degree in modern war. The obstinate and protracted wars of defense, which were waged, occasionally with complete success, even down to the eighteenth country, have become altogether things of the past.

It is authoritatively announced that the Mann boudoir cars will run on the night express between New York and Boston about October 1st. It will be remembered that these cars are models of elegance and comfort, combined with almost exclusive privacy, and are fitted up with electric call bells; and for the health of the weary traveler incandescent electric lights will be used. This innovation will prove a blessing to suffering humanity, who have to travel, as many electrical people do, almost continually. Every special agent should join with us in encouraging a departure of this kind, and in trying to extend this modern railroad service to all parts of the land; and soon, instead of that pale, wan, before-dinner expression, so often seen on the traveler, not the "S. A." one of joy, peace and comfortable rotundity will appear.

The Egan Telephone and Electric Company of Zanesville, Ohio, are manufacturing instruments under Mr. Egan's patents.

Mr. C. A. Brown, the enterprising manager of the Western Electric Company here, left for Chicago on Monday last to look after the interest of the company at that place.

Mr. E. M. Morsman, General Manager Pacific Express Company, Omaha, Neb., is spending a week in New York. Mr. Morsman is largely interested in the telephone companies along the line of the Union Pacific.

The Senate sub-committee on labor and education are on a tour through the manufacturing districts of New England and visited the Willimantic Cotton mills. Senator George was heartily pleased to find such an admirable system of conducting a large industry like this. The senator was delighted at the whole system, and especially the Brush-Swan incandescent light, which is giving so much satisfaction.

Power for Electric Light in Zurich.

(*Special Correspondence.*)

The thriving city of Zurich is situated at the foot of the Zurich Lake, on both sides of the Limmal River, which is the outlet of the lake. On account of the great quantity and velocity of the water in this river, the power which is going to waste here every day is very great and would be sufficient, if converted into electricity, to supply a very large amount of light. It has been proposed—and I believe decided—to use this power by pumping the water, by means of turbines, into a reservoir located on one of the neighboring mountains, and to run a system of high-pressure pipes from them to the different parts of the city where it will be used for supplying power to factories and to a great extent for electric lighting purposes.

Electric Light in Milan.

(*Special Correspondence.*)

Milan is one of the few European cities outside of France and England in which the incandescent light has been introduced. A number of the show-windows and stores in the grand "Galleria Vittorio Emanuele" are illuminated by it with very good effect; in the jewelry stores especially the wares glisten and sparkle much better than by daylight. An enterprising apothecary has put a lamp in the inside of the fountain over his soda-water apparatus which attracts many customers who cannot understand how that light burns in the midst of all that water. This "Galleria" being two wide passages through a large building, crossing each other in the center and covered with a large arched glass roof, affords a good opportunity for some enterprising electric light company to exhibit their lights. In the evening it is lit up with many hundred gas-jets, and is the favorite evening promenade.

Professor John T. Sprague publishes the following formulæ for wires:

"As the following formula differ in several points from those generally given to obtain the same results, it may be explained that this is owing to the definite system of which these form a part. Most other formulæ are single ones, devised each for its own purpose, and often based upon mere actual measures of particular wires, which often vary in quality. Those given here may have no actual superiority over these others, except as forming part of a definite system based upon mathematical truths, and linked especially to the conception of wires, not as each separate entities, but as consisting of collections of unit wires of definite property, thus giving to d^2 an extended meaning, from the mere square of the diameter of single wires to the number of units in all wires."

SYMBOLS USED IN THE FORMULÆ.

"Let the following letters represent the requisite particulars:

W = weight in grains. W ÷ 7000 = weight in pounds
w = ditto per foot. = M × d^2 or d^2 ÷ G.
M = ditto per mil-foot = m × s or l ÷ G or U ÷ u.
m + ditto ditto of water = .0023793 Log. — 3 3764578.
d = diameter in mils (inch .001) = square root of d^2.
d^2 = square of diameter = area in circular mils = w × G.
G = area in mils of the grain-foot = 1 ÷ M or u ÷ U.
g = ditto ditto of water = 420.29 Log. 2.6235422.
l = length in feet.
s = specific gravity. = M ÷ m or U ÷ (u × m).
R = resistance in ohms at 60° Fahr. U ÷ l ÷ W.
r = ditto per foot = R ÷ l.
U = ditto ditto of the grain-foot = r × w.
u = ditto ditto of the mil-foot = U × G or see R.
R = specific resistance of cub cent. ohm = u × 0000016624 Log. — 7.2207291.
ditto for microhms use index — 1.; for C G S units 2.
R× reciprocal of these constants gives u.
s × m gives all the data for weight, etc., so that from these two data all requisite information can be calculated.

"In working out any examples I shall use logarithms, because they are really the simplest of all modes of calculation except the slide-rule, which is, in fact, a logarithm machine. Every one should learn to use them, if only for the sake of extracting square and cube roots, which only requires the division of the logarithm by 2 or 3."

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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Sanitary Science at a Stand-Still.

If progress may be defined as that amount of advancement which can be corroborated by statistics, that of the last quarter of a century may be safely set down as phenomenal. The most superficial observer, however, is aware of the fact that scientific progress has, at least in some directions, made haste very slowly. Our modes of transportation both upon the sea and land would seem to be well nigh perfect; the system of spreading intelligence by electricity is not likely to be improved upon in the future; and various, almost innumerable discoveries have been made whereby the general public is rendered more comfortable, and the condition of the poor less unbearable. Singularly enough, however, while we have been calling upon science to furnish us with greater conveniences we have, generally speaking, forgotten to attend to that without which all the delights that science can furnish will avail but little, viz., our health.

Washington Irving, in summing up the many benefits for which the American Indians were indebted to the white man, says that it is due the white man to say that he brought with him a remedy for the disease he was about to spread among them. In like manner we have progressed in medical science so that we can almost control the disorders and maladies which come from our lack of progress in sanitary science.

With an inconsistency that seems almost childish the present age demands the most elaborate contrivances to save exertion or to highten enjoyment, but willingly contents itself with a lack of those which will preserve its health. Coal gas and other noxious fumes are led into our dwellings that consume the vital properties of that air which it was intended we should breathe free from taint, and, as if this were not sufficient, pipes are deftly led from the sewers into our very rooms.

Strange to say, plumbing work, than which since its success or failure has a very decided effect upon health, has been left in the hands of the ignorant and the slovenly. As a result, typhoid fever, diphtheria, malaria and other similar maladies are ever present with us.

As a rule, the plumber knows as much about sanitary rules and the laws of hygiene as might be looked for in a New Zealander or a polar bear. He is far more at home in making out a bill than in heading off a current of sewer-gas, and if called upon to check one already discovered, it is ten to one he furnishes it with a draught by which its progress into the bed-rooms will be accelerated. Quite recently, the public, having lost confidence in the plumber, called loudly for the sanitary engineer, and as we have been told by Mr. Mill, a demand is sure to bring a supply, the sanitary engineer soon loomed up on the domestic horizon. He talked learnedly about "traps" and "cut-offs," and the like, but up to the present writing there has been no appreciable falling off in the amount of diseases which may reasonably be traced to defective plumbing, and if a recent inquiry instituted by the New York Academy of Medicine may be relied upon, the sanitary engineer, since he is on the wrong track, may be expected to accomplish little more than the plumber. To sum up the evidence given before this society by some of the best known sanitary engineers, chemists, hygienists and plumbers, it would seem as if all that we know about the subject is that nothing can be known. Dr. Hamilton, a careful and learned man in his profession, says that with all respect to the distinguished gentlemen who testified, they suggested nothing of any importance which is new; nothing that was not known before, nothing indeed which has not been tried, and which has not for one reason or another proved itself to be either impracticable or insufficient, and in many cases totally inefficient.

In other words, science has not kept pace with civilization, and at present there is no adequate remedy. In order to render pure and innoxuous the atmosphere of the dwelling, whether the sources of the impurity are to be found in the present systems of lighting, heating and drainage, it will be necessary that civilization makes some concessions. The term civilization is here used in its broad and legitimate sense, as including not only mental culture, with progress in science and art, but also the comforts and even luxuries of life which are its natural and inevitable concomitants. If certain of the latter elements of civilization cannot be dispensed with, it will be found impossible, so says Dr. Hamilton, to contend successfully with typhoid fever, diphtheria and many other diseases which now contribute so largely to the increase of our mortality rates.

"If," he says, "we limit ourselves to the consideration of the unwholesome atmosphere of our houses—although this does not by any means constitute the only possible or probable source of sickness and physical decay incident to civilization—the concessions demanded as a condition of the successful application of our present knowledge of the laws of hygiene are: 1st. That all plumbing, having any direct or indirect communication with the sewers shall be excluded from those portions of our houses which we habitually occupy. In other words, that it shall be placed in a separate building, or annex. 2d. That we return to the open fireplace or the grate as a means of warming our private houses. 3d. A diminished consumption of oxygen by gas-burners. As long as we must depend upon gas we shall have to content ourselves with light and not insist upon illumination."

The near future is likely to settle the light question, for the incandescent system is admirably adapted to the illumination of dwellings, and as incandescent lights are encased in vacuums where there is no practical combustion at all they are not likely to vitiate the air as gas does.

It is time that sanitary science, than which no science is more important, should reach a point where it will be at least abreast of the times.

The Operator and his Advisers.

When those misguided persons, the telegraph operators, went on strike, we pointed out the inutility of such a course of procedure. We did not mean by this that the laborer was not at liberty to demand higher wages, for this is the inalienable right of all wage-workers, but that, as there was no dearth of operators in the market, a peremptory demand for higher wages could only lead to disaster; to the temporary, if not long-continued, lack of employment of those making the demand, and the necessary and consequent miseries which such a lack usually brings to those who rely for sustenance upon their daily labors.

We saw, as did many others about us, that the ill-advised movement was brought about, not by the men themselves, but by their ill-chosen leaders, who, with a lack of foresight that showed them utterly unfit to take the lead in a torchlight procession, seemed bent on precipitating what, even to the most sanguine, could scarcely be expected to lead to anything but disappointment and disaster. The general public, too busy with its own affairs to look intelligently into the subject, was led to suppose from the boldness of the leaders, that good operators were not to be had to fill the places of those on strike, and, naturally enough, concluded that the strikers would thus be enabled to force an acceptance of their demands upon their employers. What must therefore have been the disgust of the public when the discovery was made that the leaders of the movement had not even troubled themselves to ascertain the condition of the labor market before inaugurating the movement!

Among the advisers of this movement, none was so much to blame as the organ which claims to represent the interests of the operators; none so cruelly persistent at a time when even a bat in broad daylight could have plainly seen that defeat was certain. Having thus betrayed the interests of those whom it claims to serve, and having witnessed the misery which its ill-advised course had entailed upon them, one would think it might gather reason from experience and guard against further precipitation. But as if one folly only gave occasion for another, we find it to-day assisting in drawing the already impoverished operators into an Utopian scheme having for its object a co-operative telegraph company. The telegraph operator may now reasonably say with Virgil, *Nusquam tuta fides!*

The reasons given in the organ which claims to represent the interests of the operators why the projected company must prove a success are as clear as the waters in the average horse-pond, and as logical as those with which it essayed to prove the final success of the operators in the recent strike. The course of reasoning which it would seem to have adopted may be best expressed by the following example:

Let $a=1$ and $x=1$. Things equal to the same thing being equal to each other, then $a=x$. Multiplying both terms of the equation by x, we have $a\,x=x^2$. Subtracting a^2 from both members, $a\,x-a^2=x^2-a^2$. Resolving both terms into factors $a\,(x-a)=(x-a)\,(x+a)$. Dividing by $x-a$ we have $a=x+a$. Substituting a for its value x leaves us $a=a+a$. Dividing both terms by a, we get $1=1+1$, or otherwise expressed, *one is equal to two.*

Carrying out this which may not inappropriately be called the extra-sanguine or multi-sight theorem, the Operators' Coöperative Telegraph Company will no doubt prove a great success—on paper.

We have never professed to have as a single purpose the furtherance of the interests of the telegraph operators. But we propose to treat them fairly in the future as we have in the past; as fairly as we are wont to treat their fellow-workmen in the other trades who have never had cause to complain, and following out this policy we advise them not to put their money in a more than doubtful enterprise, if for no other reason, because the aforesaid enterprise is, presumably, to be managed by the same persons who recently led them heedlessly to certain defeat; who encouraged them to struggle against odds which any well informed person could see were overwhelming.

We do not say this in the interests of the Western Union Telegraph Company or any other company. We are neither beholden to telegraph companies nor their employes, but we say it simply in the interests of a large body of honest workingmen who are about to be decoyed by unscrupulous persons into a more than doubtful enterprise—an enterprise from which, if it prove disastrous, the men now passing as leaders will be the first to escape.

We shall be much surprised if any considerable number of the body of telegraphers which, for the most part is composed of sensible men, will consent to assist in chasing the chimera which their fanciful brethren are seeking to set afoot. But should they do so, it is more than probable that they will have additional reason in the future for demanding to be protected from their friends.

A large party of prominent railroad men and electricians visited Menlo Park, N. J., on Tuesday to witness the operation of Edison's electric railroad. Among those present were Superintendents Robinson, of the Third Avenue Railroad; Weyman, of the Belt Road; A. L. A. Smith, of the Dry Dock and East Broadway Road, of this city; Col. Paine, assistant engineer of the New York and Brooklyn Bridge; President Weidner, of the Market Street Road; President Kemble, of the Union Passenger Railroad; President Lafferty, of the Hestonville Railroad, and George Rice, engineer of the Union Passenger Cable Railroad, all of Philadelphia; E. T. Brooks, engineer of the Pennsylvania Railroad; C. B. Thurston, President of the Jersey City and Bergen Road; William Richardson, President of the Atlantic Avenue Company of Brooklyn; Henry Lovennger, President of the Maryland Coal Company, and others, about 50 in all. Mr. C. W. Rogers, Vice-President of the Electric Railway Company of the United States, took the party in charge. They were shown the stationary engine affording the motive power, and then, taking seats in a car, made a successful trip around the track, a stretch of two miles and a half. In reply to the favorable comments of the railroad men, Mr. Rogers said he hoped to show them the system much more complete in two months—the system as the company desired to use it. The engine would then pick up the current from a third rail, laid between the others.

Electrical Notes.

In our edition of the 6th inst., we pointed out the absurdity of the plea usually put forth by that description of "scientists" who devotes himself to the adulteration of food.

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The evil of which the REVIEW spoke so feelingly is widespread.

***

We see much of it in our own country, but it is certain that adulteration of food is by no means so extensively practiced here as on the Continent.

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The Germans and French have carried it so far that reliable authorities inform us that there is hardly an article of food capable of being manipulated that does not contain more or less foreign matter.

***

The theory upon which these chemical swindlers work would appear to be, to use harmless adulterants if possible, but if these may not be had, then anything short of quick-working poisons will answer the purpose.

***

The injury which must follow such practices among consumers must necessarily be very great, and I take it to be particularly the duty of scientific journals to lay bare the methods employed by the scoundrels engaged in the business.

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Professor Prescott, of Ann Arbor, recently took up the subject of food adulteration, and sounded a warning which if harkened to will do much to put the general public in the proper state of mind to insist upon legislative action regarding this more than reprehensible practice.

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"Adulteration," he says, "infringes upon the right of every person—unrestricted except by considerations of sanitary welfare and public police—to decide for himself what he shall eat."

***

An adulteration is a fraud, a deception, a counterfeit.

***

It is systematically concealed from the purchaser.

***

Its object, to induce people to accept an article which they would not accept for the use then wanted, if it were not for the deceit.

***

To sell an admixture of coffee and chicory, if the terms and proportions of the mixture are printed on the wrapper in a way to have them seen by the purchaser, is not adulteration.

***

To sell oleomargarine under its own distinctive name, with no credit borrowed from butter, is not an adulteration.

***

But to supply sugar made from corn-starch for the ordinary sugar made from cane juice, or to deal out milk and water or skimmed milk for pure milk, is an adulteration, a violation of the right of the consumer to obtain his food in his own discretion."

***

The plea that may be made, that the adulterant is as wholesome as the real article, "is not to be heard at all; it belongs to the consumer to judge for himself what he will provide for his own table."

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Even if the falsification be not committed, to injure health, it is directly objectionable on sanitary grounds, for it is a violation of a great safeguard of health.

***

To the plea that people are not really deceived by the false labels, but that the quality of the food is understood, tolerated, and even preferred by the customer, "let it be replied," says the professor, "if the pretense is so thin as to deceive no one, and if the admixture is in demand for use as it is, the pretense can the more easily be dropped, and, at any rate, the admixture must go under its own description and by its own name. Not a single article, unless indictable as a positive poison, need be withdrawn from the market."

***

Those who by reason of a constant use of the eyes suffer more or less from the maladies to which those organs when overworked are subject, will be glad to learn that improvements have been made in the construction of the stereoscope by which photographic pictures may be looked at with far more comfort than heretofore.

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To correct the distortion of vision sometimes experienced by persons using the common forms of stereoscopes there is always a more or less conscious effort on the part of the observer to control the muscles of the eye and to accommodate the sight to the instrument.

***

This leads to eye-weariness and sometimes even pain, and to obviate this a stereoscope has been made that may be adjusted to the sight of each person using it.

***

The two half lenses that in the ordinary stereoscope are fixed in a frame are quite loose and are supported in a flat wooden box having openings at the front and back.

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Each half lense is placed in the box by lifting the cover and is held upright by the sides of the box.

***

In the center of the box is a partition and to each side of this is fastened a flat brass spring that presses against the thin edges of the lenses and tends to push them apart.

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At the ends of the box are screws to be moved by hand from the outside.

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By turning these screws the lenses may be pushed close up against the springs, while by releasing the screws the springs push the glasses back again.

***

By this simple arrangement which, while it is not wholly new, is here made of practical value, the stereoscopic lenses can be moved nearer together or further apart to suit the eyes of the person using the instrument.

***

When adjusted to the sight the stereoscope can be used for a long time without fatigue, as there is no effort required to cause the two images to mingle into one.

***

The screen between the two glasses on the frame of a stereoscope and designed to shut off a part of each of the pictures is, in the new instrument made of brass in the form of hinged wings that can be folded and bent back against the glasses.

***

In ordinary use the screen is kept open in the usual position.

***

By folding it back and by taking out the half lenses and substituting for them a pair of thin glass prisms the stereoscope can be used in another way.

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Just behind the glasses is set up a second screen having an opening in the middle.

***

This cuts off from each eye the picture directly opposite to it.

***

In other words, when the prisms are used and the first screen is folded back and a second screen is put up, the right eye sees half the left-hand picture, while the left eye sees only one-half of the other picture, the picture in front of each being shut out.

***

This arrangement gives a reversed image, and, with the right kind of stereographs, gives stereoscopic effects of a novel and most interesting character.

This and some other applications of the new instrument have proved of great scientific interest, while the new accommodating lenses give value to the instrument in general stereoscopic work.

***

There is, of course, a great difference between a scientific and a commercial success, but it should be remembered that much may be learned by experimenting, and that, if important inventions were to be laid aside when computation showed that they would not immediately return a profit, we would be by no means so far advanced in scientific applications as we are at the present time.

***

Therefore it is that I read with much pleasure in a recent number of the publication *L'Electricité* a description of the trial of an electrical omnibus in the Champs Elysées, Paris.

***

With a number of persons aboard the vehicle moved noiselessly about here and there—now on the macadamized road-bed and again on the pavement.

***

A vast crowd gathered to witness the manœuvres of this electrical coach, for it was five o'clock in the afternoon, when the Parisian boulevards are filled with people, and the curiosity evinced at the sight of so large a vehicle moving about without horses or steam engine, or any other motive power that could be seen, was, as might be expected, intense.

***

The accumulators, placed under the seats, could not be seen even by a person looking through the door of the 'bus.

***

They worked to perfection, the conductor having no trouble to start or stop, to increase the speed or to diminish it.

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No figures being given as to amount of power expended, distance run or tractive force, I cannot, of course, give even an idea of the relative cost of such a vehicle when compared to one carrying the same number of passengers and moved by horses.

***

But it is more than probable that this cost, unless such vehicles were made on a very large scale, will exceed that at present ruling where horses are employed.

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Nevertheless, it is only by making models like this that improvements can be made; indeed, it is said that already the designer of this vehicle has found a means of greatly reducing the cost.

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He would be a bold man who should refuse to believe that not only street cars, but also omnibuses, will in the not distant future be operated by electricity.

***

In the same number of *L'Electricité* I see that the electrical railway or tramway recently established by M. C. Dupuy, of Caen, has exceeded the most sanguine expectations.

***

The first train ran from the railway station to the Exposition grounds—more than a quarter of a mile—in forty-two seconds, but could have done much better had not the conductor been compelled to put on the brakes repeatedly, owing to the crowd that passed to and fro across the track.

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Starting, slowing-up and stopping only were accomplished readily and expeditiously by means of a simple lever.

***

The motive force consisted of eighty-four accumulators placed along the sides of the motor in all comprising an electric energy of about 110 volts.

***

Until we have electric locomotion, which will come just as soon as it is found to be more economical than by steam, we must regard all improvements in steam motors with unabated interest.

***

Now, since the great bonanza farms have been established, steam motors have been utilized to do the plowing, hoeing, &c, and the manner of using these and the means whereby the engineer seeks to overcome the many difficulties he must contend with while operating on rough ground, are very interesting to those who have any taste for mechanics.

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The two difficulties that appear to be encountered in making and using traction engines are the want of power and the want of adhesion.

***

To make a powerful engine that will drag heavy loads over common roads implies the use of a large boiler, and this implies weight.

***

On soft ground the wheels of these heavy engines slip and the motor comes to a stop.

***

In a new engine recently examined an effort has been made to get over these difficulties by the use of a light tubular boiler with compound engines and a new form of driving wheel.

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The motor consists essentially of a hollow frame supported on four wheels and carrying one boiler and three double engines.

***

This frame is of plate iron and is designed to serve as a water-tank.

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The two driving wheels are 1.89 meters in diameter, and with a face or tread 63 centimeters.

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Each wheel is independent and turns on a short journal that rests on one end on the frame of the engine and on the other upon a bar that passes along the front, resting on the frame at each end.

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By this arrangement each wheel is inside the frame, very much as the paddle-wheel of a river boat is placed within the deck of the boat.

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The two forward wheels are joined together and form the leading wheels.

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They are carried upon a truck that is free to turn under the forward part of the frame, and is controlled by a hand or steering wheel.

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The boiler, which is placed between the two driving wheels, is composed of sections of double tubes built up over the fire-box.

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Each tube is composed of two parts.

***

The larger tube is for water and is exposed directly to the fire.

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The smaller tube inside this is the return flue for the smoke, so that the water is in an annular space with the flame on both sides.

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The boiler is of great strength and is designed to furnish steam at a working pressure of about four hundred pounds.

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The engines are placed on the frame on each side of the boiler and next to the driving wheels.

***

Each engine is independent and controls one wheel.

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The cylinders are double, though they look like cylinders with three piston-rods, one at one end and two at the other end.

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The smaller high-pressure cylinder is placed inside the larger cylinder, and has one piston and rod.

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The low pressure cylinder is annular in

section, and has a ring-shaped piston and two rods turned in the opposite direction from the first piston-rod.

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The engines are connected with cranks that turn small geared wheels that turn in a geared rim on the inner side of the driving wheels.

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The high-pressure cylinder is designed to take the steam at a pressure of four hundred pounds and to discharge directly into the low pressure cylinder, and the exhaust finally escapes into the open air through the smoke-stack, or into the water-tank directly under the engines.

***

At the rear of the motor is a pair of small hoisting engines, that are intended to assist in handling the gang of eight plows to be drawn behind the engine.

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It will be seen that, by the use of a tubular boiler and high pressure, the engine can be made very small, and in this way a great saving of weight together with high pressure is obtained.

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To secure adhesion in wet and soft ground a broad tread is given to the driving wheels and a novel system of shoes is employed.

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Hanging from the hub of each wheel is a pendulum, free to swing inside the wheel.

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At the end of this is a small wheel, just touching the inside of the large wheel and turning with it.

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In this wheel are hung loosely a number of teeth or claws.

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On the face of the large wheel are cut a series of holes, slightly larger than the teeth on the small wheel traveling inside.

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As the engine moves, this smaller wheel is made to turn with it, and the teeth in turn drop through the holes in the face of the driving wheel and catch in the ground.

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In this manner the driving wheels are practically shod with shovel-shaped teeth that dig into the ground and, holding fast, prevent the wheels from slipping.

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By this device the motor has a good traction, and can be used on sandy roads or upon soft, plowed ground.

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When the engine is to be used on hard roads and the teeth are not needed, the smaller wheel, turning inside the drivers, can be raised above the ground, or the teeth can be taken out.

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In either case, the small wheel revolves idly without impeding the engine or cutting up the road.

HUGH HASTINGS'S DEATH.

Passing Away Suddenly at his Country Seat by the Sea.

THE WELL-KNOWN EDITOR AND POLITICIAN, WHILE CONFINED TO HIS BED BY THE RESULT OF A MISHAP, DIES OF PARALYSIS OF THE HEART.

MONMOUTH BEACH, Sept. 12.—Hugh J. Hastings, proprietor of the New York *Commercial Advertiser*, died here at 7 o'clock this evening. He met with the accident which caused his illness while returning to his home from a fair given in aid of the Church of Our Lady, the Star of the Sea, in Long Branch, on Monday evening, Sept. 3. The phaeton in which he was driving was run into by a truck, and he was thrown violently to the ground. His physician found him suffering from a contusion on the hip and right shoulder. He was unconscious a great part of the time from that evening until his death.

"Mr. Hastings was a great parliamentarian and an adept in parliamentary devices. He was not a fluent talker. He spoke rather hesitatingly and with deliberation, and with a great deal of thought. His speech was replete with Hibernian wit and anecdote. He had a plausible and insinuating manner. There was a magnetism about the man that was attractive. He was fertile in expedients. He was not a good writer of editorials in a strictly professional sense, but he was a brilliant paragraphist. He knew how to take the English language and make a whipcord of it and lash with it. He first obtained the controlling interest in the *Commercial Advertiser* in 1869. In early life he was connected with the Albany *Scotch*, which was prolific of libel suits. He was a member of the first Republican Convention at Pittsburgh, when Henry J. Raymond wrote the platform. He has taken part in every Republican National Convention since that time, and in fact in every State and National Convention of his party since 1844. He preferred to be recognized as a journalist, and generally refused to be a delegate. He was a thorough student of politics, which he regarded as a science. He was always a machine man. The downfall of Fenton in this State was due to Roscoe Conkling and his firm friend, Hugh Hastings.

"Mr. Hastings's marked peculiarity was his frankness of demeanor both publicly and privately, and even in politics. There was no double dealing about him in the slightest degree. He did nothing by indirection. If anything had to be done by indirect means, some one else besides Hugh Hastings had to be employed. In that respect he differed from Mr. Weed, who was sly. He was a very generous man, and gave a great deal to charity. He was regarded as one of the first Roman Catholic laymen of Albany, and held much the same position there that Eugene Kelly does here. He and his wife were constantly getting up fairs. He was a great friend of Archbishop McCloskey, and was instrumental in getting that dignitary promoted to be Cardinal. He succeeded in spite of the efforts of Dean Richmond and others to get Bishop Timon of Buffalo promoted to the place. Hastings got Mr. Seward to send a secret agent to Rome in the interest of Archbishop McCloskey. He had the faculty of making people talk. He could draw them out without talking much himself. He was fond of saying that he grappled his friends to him with hooks of steel."

Another Barb-Wire Suit.

CHICAGO, Sept. 12, 1883.

The Washburn & Moen Manufacturing Company, manufacturers of barb-wire fencing and owners of the patents which control the making of barb-wire, filed a petition for a writ of injunction against the Lyman Manufacturing Company of Chicago in the United States Circuit Court to-day.

The company represents that it is the sole owner of patents for making barb-wire, and as such owner it licensed the Chicago Company in January, 1881, to manufacture barb-wire, not to exceed in quantity 2,500 tons a year or to employ therein more than 22 barb-wire machines. But instead of sticking to this agreement the Lyman Company has, since January 1, 1883, already manufactured 3,100 tons, being in eight months 600 tons more than it is entitled to make in an entire year, and is yet hard at work making more.

The Washburn & Moen Company asks for $100,000 damages and an injunction restraining the company from making more than 2,500 tons a year hereafter. The reason offered why this should be done is that the price of barb-wire may not be lessened by over-production and that the monopoly of the patentees may not be disturbed.

An illustrated paper entitled "Amerika" published in Vienna, Austria, by Otto Maass, comes to us three times a month. It is chiefly devoted to American subjects and information concerning emigration, and will be found of great value to those intending to try their fortunes in this country. Mr. Maass was formerly a resident of Philadelphia.

A Perpetual Calendar.

A very convenient little invention is Heath's Forever Calendar, which is so arranged as to be equally good in 1883 or in 1983, and for every year between, and, if that is not satisfactory to this age which wants so much and generally gets it, the calendar may be used in 2083, and so on *ad finitum*. It is as perpetual as Hon. General Daniel Pratt's well-known smile, and it is not very large, unlike that great traveler's words of wisdom. The form is circular, and consists of two pieces of card, one of which is movable. The Forever Calendar is very convenient and will become popular. It is manufactured by Elroy N. Heath, the well-known maker of indexes, letter files, &c , at 147 High street, Boston.

European estimates of the population of China are being reduced. Behm and Wagner reduce their estimate for China and Corea from 434,500,000 to 379,500,000. Peterson reduces his estimate by 75,000,000, making the present total 350,000,000. Dr. Happer, missionary, believes this can safely be reduced another 50,000,000. Mr. Hippisley, acting commissioner of customs, thinks 250,000,000 more nearly correct than 350,000,000. The losses by the Taeping and Mahometan rebellions, and by the famine and pestilence which swept the provinces of Chili, Shangtung, Shansi, Shensi, and Honan, are variously estimated at from 61,000,000 to 81,000,000.

The firm of Davis & Watts, manufacturers of electrical apparatus at Baltimore, Md., has been changed. Mr. Davis having purchased Mr. Watts' interest, he has recently organized a new electrical manufacturing company under the name of the Viaduct Manufacturing Company of Baltimore. Mr. A. G. Davis, the President, will give his personal attention to the business of the company, assisted by Mr. A. B. Proal, the Secretary and Treasurer. Their friends in the telephone and telegraph field will soon have substantial evidence that they are still with them and ready to meet all demands.

An alloy of forty parts of copper and sixty parts of ferro-manganese, with a suitable quantity of some appropriate flux, produces a metal of such tenacity that it surpasses the best steel armor plates. The melted mixture is cast in blocks and is perfectly malleable. To obtain a white metal that can be rolled out in sheets, the above alloy is melted again, and twenty or twenty-five per cent of zinc or white metal added, which imparts to it the desired quality.

The Board of Examiners-in-Chief of the patent office has rendered a decision, reversing a former decision of the Examiner of Interferences, and awarding priority of invention to Thomas A. Edison for an "incandescent conductor for an electric lamp formed of carbonized paper." William E. Sawyer and Albin Man contested Edison's claim.

Black Bass Fishing by an Expert at Croton Lake, N. Y.

Colonel M. W. Goodyear of L. G. Tillotson, & Co., on Tuesday last caught thirty-one black bass in two hours' fishing at Croton Lake. Nine of these beauties weighed over 2 pounds each. The Colonel is stopping for a few weeks' recreation at the Croton Lake House. If we could allure the bass to our hook as easily and artistically as the Colonel seems to do we would have no further use for Barnegat Bay.

Courtney again. Not rowing a winning race, but earnestly assuring a reporter that he can row a winning race, even with Hanlan as an antagonist. Of course. Nothing but the fact that words are not deeds prevents Courtney from distancing Mr. Gould's "Atalanta." Artemus Ward once sagely remarked that the insertion of a joke now and then greatly improved a comic paper. The insertion of a few victories would greatly improve Courtney's record.

The Brotherhood of Telegraphers has withdrawn from the Knights of Labor.

New Books.

Just published. Illustrated by three plates and forty-eight engravings, 8vo, cloth. Philip Reis: Inventor of the Telephone. A biographical sketch, with documentary testimony, translations of the original papers of the inventor and contemporary publications. By Sylvanus P. Thompson, B. A.; professor of experimental physics in University College, Bristol. Contents: Biography of the inventor. The inventor's apparatus, (*a*) transmitters, (*b*) receivers. The claim of the inventor. Contemporary witnesses. Comparison of Reis's transmitters with recent instruments. On the variation of electric resistance at a point of imperfect contact in a circuit. Comparison of Reis's receivers with recent instruments. On the doctrine of undulatory currents. Schedule of authorities and references. Additional references concerning Reis's telephone.

Professor Thompson's book, which treats exhaustively the early history of the telephone, is not only of scientific but of social interest and importance. It establishes beyond honest doubt or question, by historical evidence, by the reproduction of original documents and illustrations, and by the public records of scientific bodies, that Philip Reis discovered *the electric transmission of speech* in 1860-'61; that he elaborately described and exhibited his telephone in 1861; that he invented transmitting and receiving instruments which not only talked then and talk now, but which include the essential principles of the transmitters and receivers now in use; and that he manufactured, placed on the market, and sold his instruments in 1863, for the purpose of illustrating the electric transmission of speech and song. Price, $3; free by mail. Published by E. & F. N. Spon, 35 Murray and 60 Church streets, New York.

NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPTEMBER 11, 1883.

284,594 Telephone System, John P. Barrett, Chicago, Ill.

284,595 Telephonic and Telegraphic System, John P. Barrett, Chicago, Ill.

284,605 Electric Battery, Hugh A. Burns, Ansonia, Conn.

284,643 Underground Tube for Telegraph Wires, Wilhelm Lenderoth, New York, N. Y.

284,655 System of Laying Telegraph Wires, Andrew J. O. Reilly, St. Louis, Mo.

284,670 Electrically Operating Railway Gates or Signals, Theodore A. B. Putnam, New York, N. Y.

284,714 Safety Device for Electric Wires, Alex. Bernstein, Boston, Mass.

284,715 Electric Switch or Circuit Controller, Alex. Bernstein, Boston, Mass.

284,779 Retort for Carbonizing Incandescents, Chas. J. Van Depoele, Chicago, Ill.

284,784 Apparatus for Lighting Gas by Electricity, Henry J. Warren and Henry F. Packard, Brockton, assignors to Henry F. Chase, Boston Mass.

284,805 Suspending and Circuit Controlling Mechanism for Electroliers, Arthur W. Brentnall, Westminster, England.

284,840 Double Circuit Instrument, Alvah W. Hall, Meriden, Conn.

284,841 Electric Switch and Signal Apparatus, Alvah W. Hall, Meriden, Conn.

284,842 Apparatus for Interlocking Electric Signals, Alvah W. Hall, Meriden, Conn.

284,854 Underground Electric Conductor, J. Burrows Hyde, New York, N. Y.

284,855 Apparatus for Constructing Electric Conductors, J. Burrows Hyde, New York, N. Y.

284,878 Electrical Annunciator, David A. McCormick, Detroit, Mich., assignor of one-half to Lewis Mann, same place.

284,908 Telephone Switch, Charles E. Scribner, Chicago, Ill., assignor to Western Electric Company, same place.

284,909 Telephone Switch, Charles E. Scribner, Chicago, Ill., assignor to Western Electric Company, same place.

284,939 Carbon for Arc Lamps, Forest Bain, Minneapolis, Minn., assignor to Bain Electric Company, Chicago, Ill.

284,959 Electric Wire, William Halkyard, Providence, R. I, assignor of one-half to Henry A. Church, same place.

294,970 Electrical Conductor, Frank Moore, Philadelphia, Pa.

A man can no more protect himself against the influence of evil company than he can dive into a tar barrel and come out unsoiled.

Manufacturing News.

It is reported that the new car works are to be constructed at Curtis Creek, the terminus near Baltimore of the Baltimore and Ohio Railroad, $150,000 of the necessary $300,000 capital having been secured. The Baltimore and Ohio offer to start the works with an order for 2,000 cars.

The *Industrial World* states that ground has been purchased at Chicago by the Ellithorpe Air-Brake Company, where it is pushing forward the erection of its 4-story and basement factory 50x150 feet. This factory will be devoted to the production of screw-geared, hand and hydraulic elevators. It is intended to have the buildings completed by December 1, when a force of 50 or 60 men will be employed in them with capacity for turning out one machine complete per day; $15,000 worth of additional machinery, including a 75-horse power Corliss engine and a 100-horse power boiler, will be put in.

List of Electrical Discoveries and Inventions.

The convective electrical discharge between charcoal or carbon points, known as the voltaic arc, was discovered by Davy, of England, in 1813.

An electric current was found to exist in a copper plate when rotated between the poles of a magnet by Faraday, of England, in 1831. He also discovered magneto-electric induction during the same year.

The first magneto-electric machine was constructed by Pixii, of France, in 1832.

Continuous-current generators with ring armatures were devised by the following persons prior to Gramme: Pacinotti, of Italy, in 1860; De Romilly, of France, in 1866, and Pfaundler, of Germany, in 1867 and 1870.

The first incandescent electric lamp with a platinum or carbon conductor in a glass globe or vacuum was invented by Starr, of Cincinnati, O., in 1845.

The first arc lamp with the differential method of regulating the carbons was invented by Lacassagne and Thiers, of France, in 1856, and reinvented by Tchikoleff, of Russia, in 1871.

BUSINESS NOTICES.

THE BOSTON ELECTRIC PROTECTIVE ASSOCIATION, office, 56 Summer street, Rooms 7 and 8, Boston.—The object of this corporation is the maintenance and extension of the burglar alarm telegraph and patrol system. It comprises a perfect system of burglar alarm with register, showing the time of opening and closing banks, stores, private residences, public buildings, &c., as well as protecting all the possible points of entrance to a building or premises. By this system every place protected is provided with an automatic register, which is operated on your own premises, and which will invariably show the time of opening in the morning and the time of closing in the evening. The most important work to be done in connection with this system is the work of protecting the premises between the time of closing in the evening and the time of opening in the morning. Should any of the protective points be opened during this time we are instantly notified of the fact at our Central Office, which is so situated that any part of the whole circuits may be reached by our patrol within three minutes. It is evident that the city police cannot keep any one man's premises continually in view; it is necessary for them to go over a given route a certain number of times during the night, consequently the burglar watches his opportunity and pushes operations during their absence from any special locality. It will be impossible to do anything of this kind with our system, as we have a sufficient force always on hand, who, upon receiving a signal, at once repair to the spot. The opening of any door, or entrance of any kind, gives the number of the premises at our office, and whether the opening is made by a watchman from the inside or by a burglar from the outside, we receive the signal in either case—which is promptly responded to. Our patrol service in connection with a burglar alarm telegraph has been proved to be of great importance in protecting subscribers against loss of property from their premises, by every possible means, whether from carelessness on the part of subscribers themselves, or their employes, from fire or smoke, water or gas leakage, burglary, or from any cause whatsoever, so far as it is possible for a sure and unfailing vigilance to protect against loss. Where parties employ an inside watch upon their premises, our system is so arranged as to, if desired, oblige such inside watch to register their presence at such points in the premises as it may be desired to have visited during the night. Should such watchman fail to send in his regular signals within a specified time, we dispatch one of our reserve force immediately to the premises to ascertain the cause of delay. Our patrol force being obliged to make their rounds under all conditions, and knowing well that the watch-clock which we place on the premises of each subscriber will do no favors, they therefore neglect nothing, and we think we do not overstate the facts when we say that there is no system of protection to be found elsewhere which will at all compare with this. The Boston Electric Protective Association, 56 Summer street, rooms 7 and 8. Benj. F. Dyer, treasurer; G. W. Adams, superintendent.

Bradley A. Fiske, Consulting Electrical Engineer, 59 Astor House. Advice to inventors, calculations, etc.

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FOR SALE—United States and Canadian rights in an arc lamp; inventor desires to sell his patents outright for a moderate sum. Address "Arc Lamp," P. O. Box 3329, New York City.

WANTED—An experienced telephone man of ability who can take the position of superintendent or manager, and can speak the Spanish language. Address "M. C." care of this office, P. O. Box 3329.

A mechanical and electrical engineer, graduate of the United States Naval Academy, desires an engagement; highest testimonials. Address G. S., 25 Bowdoin street, Boston, Mass.

WANTED—By September the 30th, a situation by a young man of large practical experience in an electric light company, to put up or run dynamo machines; can adjust and regulate lamps, run line wires, etc. Address, "Experience," P. O. Box 3329, New York.

VIADUCT MANUFACTURING COMPANY OF BALTIMORE CITY.—Works, Relay Station, Baltimore and Ohio Railroad; office, Chamber of Commerce, rooms 29 and 31. This company, in connection with its present affairs, will continue the business of the late firm of Davis & Watts, to which it has succeeded; the latter firm having dissolved, and Mr. Augustus G. Davis, its senior member, having assumed its entire assets and liabilities. Mr. Davis has transferred to this company (of which he is president) all interests of whatever nature heretofore pertaining to Davis & Watts, and will henceforth give his personal supervision to the manufacture of electrical goods of every description. Having increased facilities and ample capital, we will carry a large stock of telephone, telegraph, electric light, and American district supplies of all kinds. Our works are on the Patapsco River, at the relay station of Baltimore and Ohio Railroad, with an abundance of water power. We carry continually a large stock of cross-arms, pins, brackets, insulators, and wire (both line, office, and electric light), and our prices will be found most reasonable. We solicit a continuation of the favors heretofore extended by customers to the late firm of Davis & Watts, in the assurance that we can and will make it to their advantage. We have in preparation a new illustrated catalogue, which, when ready, we shall be pleased to furnish.

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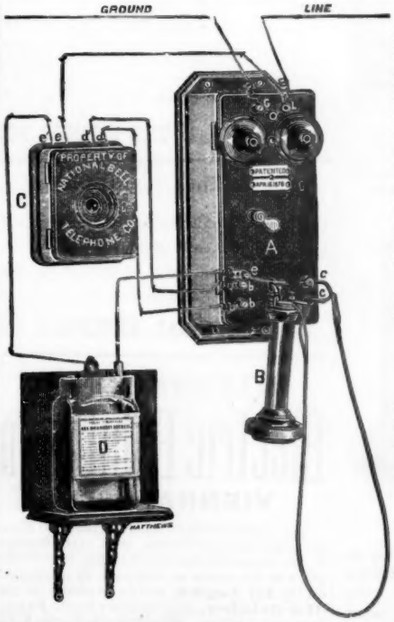

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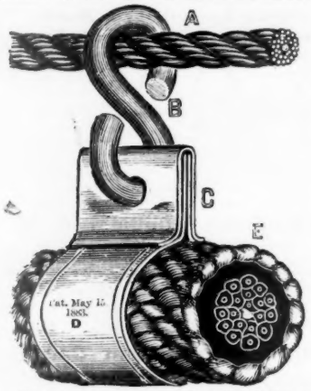

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The Commission of the International Electric Exhibition at Vienna, 1883, gives due notice to the public that this Exhibition is to take place in the course of this year, to be opened on the **1st August,** and to be closed on the **31st October,** and cordially invite Exhibitors and Visitors. The Regulations and the blanks necessary for Applications are to be had at the **Austrian-Hungarian Consuls.** The objects to be exposed will comprise all Machinery, Apparatuses and Implements connected with Electrotechnic It will certainly afford a good opportunity to inventors to show their latest improvements. This Exhibition is greatly favored by the Austrian Government, and will be held in the Rotunda of the well-remembered Universal Exhibition of 1873. Exhibitors are requested to procure the necessary papers at once.

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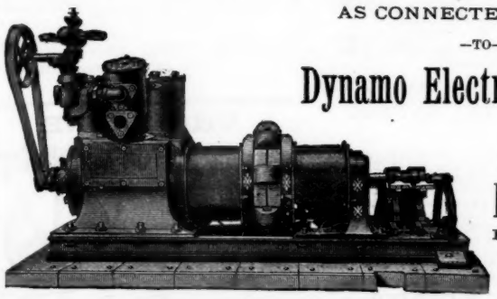

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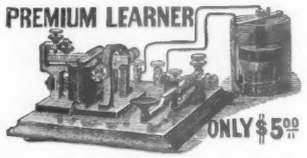

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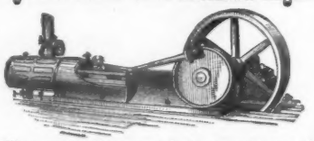

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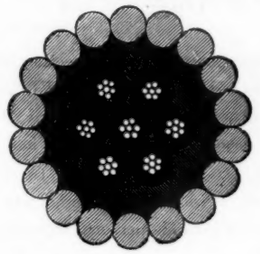

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